Actuarial Review of the Federal Housing Administration Mutual Mortgage Insurance Fund Forward Loans for Fiscal Year 2012

November 5, 2012

Prepared for

U.S. Department of Housing and Urban Development

By

Integrated Financial Engineering, Inc.

Integrated Financial Engineering

IFE Group, 51 Monroe Street, Suite 1100, Rockville, MD 20850, U.S.A

Phone: (301) 309-6560
Fax: (301) 309-6562
info@ifegroup.com

November 5, 2012

The Honorable Carol J. Galante
Acting Assistant Secretary for Housing – Federal Housing Commissioner
U.S. Department of Housing and Urban Development
451 Seventh Street, SW, Room 9100
Washington, DC 20410

Dear Ms. Galante:

IFE Group has completed and, along with this letter, is submitting the fiscal year 2012 Actuarial Review of the Mutual Mortgage Insurance Fund Forward Loans (the Fund).

We estimate that the Fund's economic value as of the end of fiscal year 2012 was *negative* $13.48 billion and the unamortized insurance in force was $1,126.27 billion. We project that at the end of fiscal year 2019 the Fund's economic value will be $54.25 billion and the unamortized insurance in force will be $1,458.77 billion. We also estimate that the economic value could be positive in FY 2012, under more favorable economic scenarios than those represented by the base-case assumptions. On the other hand, the economic value could remain negative through FY 2019, under more pessimistic economic scenarios than those represented by the base-case assumptions.

The financial estimates presented in this Review require projections of events more than 30 years into the future. These projections are dependent upon the validity and robustness of the underlying model and assumptions about the future economic environment and loan characteristics. These assumptions include economic forecasted by Moody's Analytics and the assumptions concerning compositions of future endorsement portfolios projected by FHA. To the extent that actual events deviate from these or other assumptions, the actual results may differ, perhaps significantly, from our current projections. The models used for this Review are, by nature, large and complex. We applied an extensive validation process to assure that the results reported in this Review are accurate and reliable.

The full actuarial report explains these projections and the reasons for the changes since last year's actuarial review.

Very truly yours,

Tyler T. Yang, Ph.D.
Chairman and CEO
Integrated Financial Engineering, Inc.

Actuarial Review of the
Federal Housing Administration
Mutual Mortgage Insurance Fund
Forward Loans
for Fiscal Year 2012

I have reviewed the "Actuarial Review of the Federal Housing Administration Mutual Mortgage Insurance Fund, Forward Loans, for Fiscal Year 2012," dated November 5, 2012. The purpose of my review was to determine the soundness of the methodology used, the appropriateness of the underlying assumptions applied, and the reasonableness of the resulting estimates derived in the Review

The Review was based upon data and information prepared by the Federal Housing Administration (FHA). I have relied upon the FHA for the accuracy and completeness of this data. In addition, I also relied upon the reasonableness of the assumptions used in the economic projections prepared by Moody's Analytics, from which the base case used in the Review was derived.

It is my opinion that on an overall basis the methodology and underlying assumptions used in the Review are reasonable and appropriate in the circumstances. In my opinion the estimates in the Review lie within a reasonable range of probable values as of this time although the actual experience in the future will not unfold as projected.

Phelim P. Boyle

Phelim Boyle, Ph.D., FIA, FCIA
Fellow of the Institute of Actuaries (UK)
Fellow of the Canadian Institute of Actuaries
November 5, 2012

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Executive Summary

The 1990 Cranston-Gonzalez National Affordable Housing Act (NAHA) requires an independent actuarial analysis of the economic net worth and financial soundness of the Federal Housing Administration's (FHA's) Mutual Mortgage Insurance Fund. The Housing and Economic Recovery Act of 2008 (HERA) moved the requirement for an independent actuarial review into 12 USC 1708(a)(4). This report presents the results of our analysis for fiscal year (FY) 2012.

HERA also moved several additional programs into the Mutual Mortgage Insurance Fund. One of them, Home Equity Conversion Mortgages (HECMs, which are reverse mortgages) is analyzed separately and is excluded from this Review. ***In the remainder of this Review, the term "the Fund" refers to the MMI Fund excluding HECMs.***

The primary purpose of this actuarial review is to estimate

- the *economic value* of the Fund, defined as the sum of existing capital resources, total assets less total liabilities of the Fund, plus the net present value of the current books of business, *excluding HECMs*, and

- the total insurance-in-force (IIF) of the Fund, *excluding HECMs*.

This year, we used a stochastic method to estimate the net present value (NPV) of future cash flows. In previous Reviews, the net present value of the cash flows was computed along a single, deterministic path of house prices and interest rates. In this year's Review, instead of a single path, we generated 100 equally likely paths to conduct a Monte Carlo simulation, and computed the net present value of the cash flows for each of them. Then we averaged these 100 numbers to obtain our estimate of the expected NPV of the future cash flows under our simulation procedure. This provides our base case estimates.

Based on our stochastic simulation analysis, we estimate that the economic value of the Fund as of the end of FY 2012 is *negative* $13.48 billion. This represents a $14.67 billion drop from the $1.19 billion estimated economic value as of the end of FY 2011. Because the HECM business is excluded from this analysis, we do not report the capital ratio of the Fund.

We project that there is approximately a 5 percent chance that the Fund's capital resources could turn negative during the next 7 years. We also estimate that under the most pessimistic economic scenario, the economic value could stay negative until at least FY 2019.

A. Status of the Fund

Exhibit ES-1 reports the estimates of the Fund's current and future economic value and insurance in force (IIF) using 100 simulated paths and taking the average of the resulting 100 economic values. Both the economic value and the IIF of the Fund are expected to increase each year over the next seven years.

Exhibit ES-1: Projected Fund Performance for FYs 2012 to 2019 ($Millions)

Fiscal Year	Economic Value of the Fund[a]	Unamortized Insurance in Force[b]	Amortized Insurance in Force[b]	Economic Value of Each New Book of Business	Volume of New Endorse-ments[c]	Investment Earnings on Fund Balances
2012	-13,478	1,126,267	1,053,329	11,922	211,737	
2013	-2,585	1,223,784	1,136,509	10,987	219,605	-95
2014	4,223	1,291,771	1,186,208	6,845	167,031	-37
2015	11,525	1,317,205	1,194,820	7,222	176,024	80
2016	20,984	1,353,817	1,217,462	9,163	221,233	296
2017	31,352	1,399,213	1,248,114	9,698	231,621	670
2018	42,502	1,436,476	1,269,906	9,988	235,533	1,162
2019	54,251	1,458,771	1,277,260	9,989	242,660	1,760

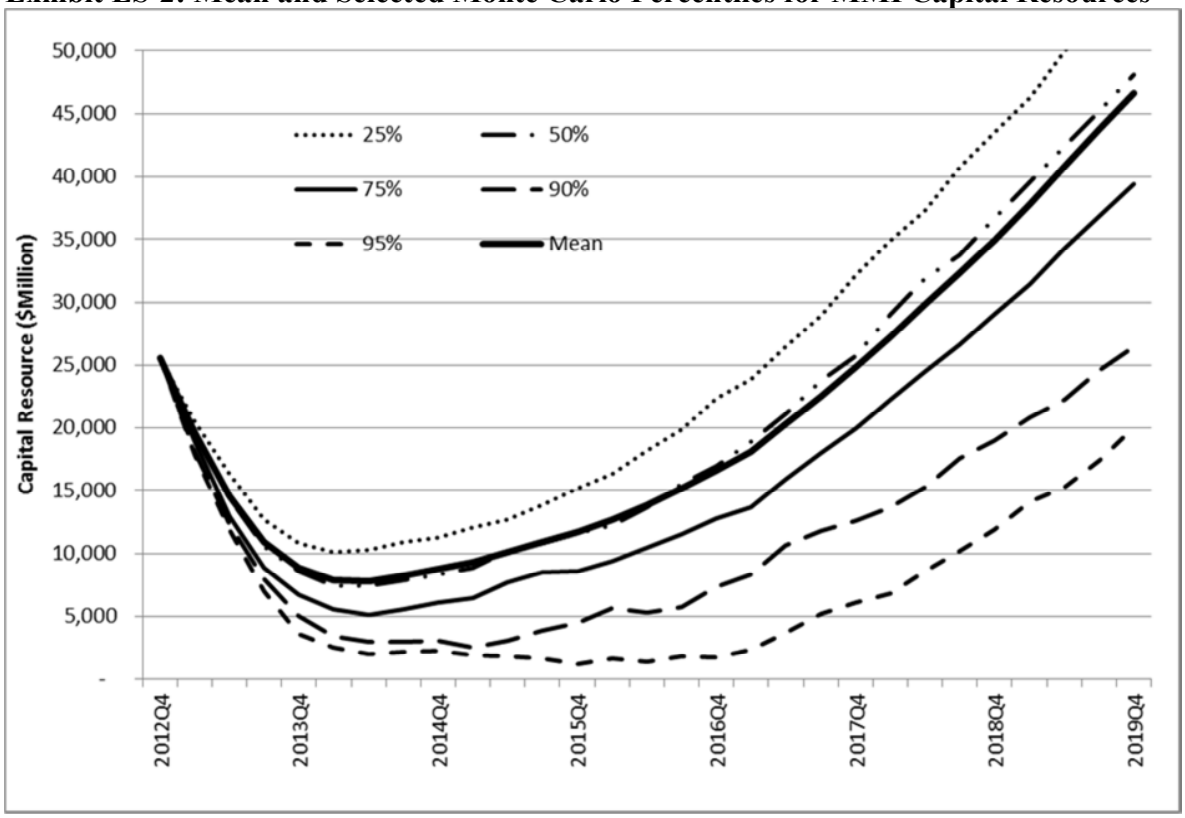
[a] All values are as of the end of each fiscal year. The economic value for FYs 2012 through 2019 is equal to the economic value of the Fund at the end of the previous year, plus the current year's interest earned on the previous Fund balance, plus the economic value of the new book of business.
[b] Estimated based on the data extract as of June 30, 2012, our model of new endorsement volumes, and projected loan performance.
[c] Based on our endorsement volume forecast model described in Appendix F.

In defining the statutory capital ratio, NAHA stipulates the use of unamortized insurance-in-force as the denominator. However, "unamortized insurance-in-force" is defined in the legislation as "the remaining obligation on outstanding mortgages" – which is generally understood to describe amortized IIF. To allow the flexibility of calculating the capital ratio under either definition, both the unamortized and amortized IIFs are reported in this Review. Following the convention of previous Actuarial Reviews, most of our discussion in this Review focuses on the unamortized IIF.

The capital resources of the Fund at the end of FY 2012 were estimated to be $25.57 billion. We simulated the capital resources over the next seven years along the 100 possible future economic

paths of the stochastic simulation. Exhibit ES-2 shows that there is approximately a 5 percent chance that the capital resources may fall to below zero during the next seven years.

Exhibit ES-2: Mean and Selected Monte Carlo Percentiles for MMI Capital Resources



B. Sources of Change in the Status of the Fund

Change in Economic Value from FY 2011 to FY 2012

We estimate that the economic value of the Fund was *negative* $13.48 billion as of the end of FY 2012, which represents a decrease of $14.67 billion compared to the estimated economic value of $1.19 billion as of the end of FY 2011 reported in last year's Actuarial Review. Meanwhile, there has been a $56.92 billion increase in the estimated unamortized IIF from $1,069.35 billion to $1,126.27 billion.

Current Estimate of FY 2012 Economic Value Compared with the Estimate Presented in the FY 2011 Actuarial Review

Our current estimate of the FY 2012 economic value is $22.83 billion lower than the economic value projected for FY 2012 in the FY 2011 Actuarial Review. Our current estimate of the FY 2018 economic value is $42.50 billion, which is $16.95 billion lower than estimated in the FY 2011 Actuarial Review. The FY 2012 differences are attributed to the following changes, with the magnitude of the change in the estimated FY 2012 economic value for each of the changes shown in parentheses:

- including the Settlement Fund received from five largest mortgage servicers (+$1.12 billion),
- using the updated data to estimate origination volume of the FY 2011 to FY 2012 books of business (+$3.26 billion),
- updating models for predicting loan-status transitions (-$0.75 billion),
- introducing claim type (conveyances vs. pre-foreclosure sales) prediction model (-$5.04 billion)
- modifications to the loss severity model to increase precision in stressful environments (-$5.24 billion)
- updating actual performance in FY 2011-2012 and portfolio composition (+$0.54 billion)
- updating the interest rate forecast (-$8.03 billion)
- updating the house price growth rate forecast (-$10.53 billion)
- updating interest rates used for discounting future cash flows (-$1.07 billion),
- updating FHA's new insurance premium schedule for FY 2012 endorsements (+$0.14 billion),
- adjusting REO claims with the distressed asset securitization program (+1.23 billion),
- adjusting claims for the large inventory of delayed claims (-$1.24 billion),
- implementing stochastic interest rate simulation (+$1.67 billion).
- implementing stochastic house price growth rate simulation (-$0.13 billion),

In total, the estimated economic value of the Fund decreased during FY 2012 and is $14.67 billion lower than that of last year.

Additional Comments

The estimates presented in this Review reflect projections of events more than 30 years into the future. These projections are dependent upon a number of assumptions, including economic trend forecasts by Moody's Analytics and the assumption that FHA does not change its policies regarding refunds, premiums, distributive shares, underwriting or servicing rules, and administrative expenses. To the extent that these or other assumptions are subject to change, the actual results may vary, perhaps significantly, from our current projections.

Estimation of the variables in the models used for predicting prepayments and claims depends on large amounts of loan-level data, requiring extensive data processing. To complete the Review within the timeframe required by HUD, we used the actual historical loan-level data as of March 31, 2012 provided by HUD. We supplemented that with various updates up to August 2012. Although we have not audited the data for accuracy, we have reviewed the data provided by HUD for integrity and consistency and believe it to be reasonable. However, the information contained in this report may not correspond exactly with other published analyses that rely on HUD data compiled at different times or obtained from other systems.

C. Impact of Economic Forecasts

The economic value of the Fund and its pattern of capital accumulation to FY 2019 depend on many factors. One of the most important factors is the prevailing economic conditions throughout the next 37 years, and most critically during the first 10 years of that time period. We captured the most significant factors in the U.S. economy affecting the performance of the loans insured by the Fund through the use of the following variables in our models:

- 30-year home mortgage commitment rates
- Ten-year Treasury rates
- One-year Treasury rates
- One-year LIBOR rates
- Growth rate of local house prices
- Local unemployment rates
- Interest rates for cash-flow discounting

The projected performance of FHA's books of business, measured by their economic value, is affected by changes in these economic variables. The base case results of this report are based on Monte Carlo simulations centered on Moody's Analytics quarterly forecasts for interest rates and MSA-level average house price appreciation rates, which Moody's Analytics forecasted simultaneously along with other macroeconomic and regional variables including local unemployment rates, as of July 2012.

We also estimated the economic value the Fund under seven different economic scenarios. They are:

- 10th Best Path in Simulation
- 25th Best Path in Simulation
- 25th Worst Path in Simulation
- 10th Worst Path in Simulation

- Worst Path in Simulation
- Moody's Protracted Slump
- Low Interest Rates

These seven scenarios do not represent the full range of possible experiences, but they represent different levels of variation under different economic conditions, and hence provide insights into the projected performance of the Fund under a range of economic environments. Exhibit ES-3 shows that there is an 80 percent chance that the FY 2012 economic value would be in the range between *negative* $25.08 billion and positive $2.83 billion. Moody's protracted slump scenario has a FY 2012 economic value similar to that of the worst path in the simulation, both representing the economic value under a 99.5 percent stress test. From these scenarios, we also interpolated that there is approximately 87 percent chance the FY 2012 economic value would be negative.

Exhibit ES-3: Projected Fund's Economic Value Under Alternative Economic Scenarios ($ Millions)

Fiscal Year	Baseline Monte Carlo	10th Best Path	25th Best Path	25th Worst Path	10th Worst Path	Worst Path	Protracted Slump	Low Interest Rates
2012	-13,478	2,827	-6,126	-19,497	-25,083	-65,305	-65,409	-31,058
2019	54,251	71,711	52,636	38,351	25,105	-49,675	-12,000	41,291

Impact of Downpayment Assistance Program

The passage of HERA prohibits FHA's endorsement of seller-financed downpayment assistance loans on or after October 1, 2008. These loans experienced claim rates that were considerably higher than otherwise comparable non-assisted loans. The share of loans with downpayment assistance from non-profit organizations quickly diminished after the passage of HERA. The significance of eliminating these types of loans is highlighted by our estimate that if non-profit assisted loans had always been excluded, the economic value of the Fund would have been positive $1.77 billion in FY 2012.

Section I: Introduction

The 1990 Cranston-Gonzalez National Affordable Housing Act (NAHA) mandated that the Federal Housing Administration's (FHA's) Mutual Mortgage Insurance (MMI) Fund maintain a capital ratio of 2 percent from October 1, 2000 forward. The capital ratio is defined by NAHA as the ratio of the Fund's economic value to its unamortized insurance-in-force (IIF). NAHA also established the requirement for the MMI fund to undergo an annual independent actuarial review. The Housing and Economic Recovery Act of 2008 (HERA) moved the requirement for an independent actuarial review into 12 USC 1708(a)(4).

IFE Group was engaged by the Department of Housing and Urban Development (HUD) to conduct the independent actuarial review to estimate the economic value and IIF of the forward mortgages in the MMI Fund for FY 2012. One of the programs that were moved into the Mutual Mortgage Insurance Fund, Home Equity Conversion Mortgages (HECMs), is analyzed in a separate report and is excluded from this document. HUD will combine the results from the two separate reports to compute the consolidated economic value and capital ratio of the entire MMI Fund. The combined economic value and capital ratio of the entire MMI Fund are the measures specified by Congress to assess whether the MMI Fund meets the capital standards set forth in NAHA. We will refer to the forward mortgage portfolio excluding HECMs as "the Fund" in this report.

The analysis in this review relies on information provided by HUD, such as the historical performance of the existing loans in the Fund and the projected composition of future mortgage originations. It also relies on future economic conditions based on Moody's independent forecasts. IFE has created a distribution of simulation paths around Moody's baseline forecast.

A. Implementation of NAHA

Following release of the FY 1989 Actuarial Review and the ensuing debate, Congress mandated various changes to the MMI Fund. The required revisions focused on five major issues: 1) development of an actuarial standard of financial soundness, 2) modification of the minimum borrower downpayment requirement, 3) changes in insurance premiums, 4) limitations on distributive shares, and 5) modification of underwriting standards and data requirements.

The changes called for in the Act were specifically designed to remedy the financial difficulties encountered by the Fund during the 1980s. Each change was intended either to reduce risks inherent in new books of business or to adjust premiums to more adequately compensate for the risks.

The NAHA legislation required that the Fund be operated on an actuarially sound basis. It provided specific capital standards and timeframes over which those standards should initially be met. It also defined the critical actuarial measure as the ratio of the Fund's capital, or economic value, to its unamortized IIF, defined by the legislation as the remaining obligation on outstanding mortgages. This ratio thus established the capital standard for the Fund.

To further strengthen the capital position of the Fund, the NAHA legislation linked FHA's ability to pay distributive shares to the actuarial soundness of the entire MMI Fund (as defined in the legislation), rather than solely considering the performance of the loans endorsed during a particular year, as had been done in years prior to 1990. This amendment allowed distributive share payments only if the Fund achieved the capital standard established by the legislation, and then at the discretion of the Secretary of HUD. No distributive shares have been paid since the passage of NAHA. In all our prior analyses of Fund performance, IFE has assumed continuation of the current HUD policy that no distributive shares will be paid, and we continue to make that assumption in the 2012 Review.

B. FHA Policy Developments and Underwriting Changes

Since the mid-1990's, FHA has implemented a number of policy changes that affected the financial strength of the MMI Fund. Major changes have included revised underwriting guidelines, changes to homeownership counseling requirements, implementation of automated underwriting systems, changes to upfront and annual mortgage insurance premium schedules, changes in loan limits, elimination of seller-financed downpayment assistance, and foreclosure avoidance and loss mitigation programs. Each of these developments is summarized below.

1. Revised Underwriting Guidelines and Other Policy Issues

In 1995, FHA introduced several changes in their underwriting guidelines to eliminate unnecessary barriers to homeownership, provide flexibility to underwrite creditworthy non-traditional and underserved borrowers, and clarify certain underwriting requirements so that they would not be applied in a discriminatory manner. While these modifications enabled many additional households to become homeowners, the relaxation of the underwriting rules also contributed to an increase in FHA claim rates for loans originated after 1995.

Changes were made in 1998 to underwriting guidelines for adjustable rate mortgages (ARMs) to address the high losses on ARMs that FHA was experiencing. Based on FHA's study of ARM claim rates, it was deemed necessary to change credit policies to maintain the MMI Fund's actuarial soundness. As a result of these changes, ARM borrowers must qualify using a mortgage payment level based on the maximum second-year interest rate. Also, any form of temporary interest rate buy-down for ARMs could no longer be used to create qualifying payment ratios.

HERA increased the minimum borrower cash equity investment requirement to 3.5 percent for purchase loans.[1] Also in 2008, FHA established a minimum FICO score of 500 for loans with 90 percent or higher loan-to-value ratios. This rule was further tightened in 2010.[2] Starting October 4, 2010, borrowers with credit scores below 500 are no longer eligible for FHA insurance, and the maximum loan-to-value ratio for borrowers with credit scores between 500 and 579 is limited to 90 percent. In 2012,[3] FHA modified documentation requirements for self-employed borrowers. Starting from April 1, 2012, P&L and balance sheets have been required in most cases. Also for the purpose of identity-of-interest transactions, the family member definition was expanded to include the extended family, including brothers, sisters, uncles, and aunts.

2. Changes to the Homeownership Counseling Discount

Another focus of the 1998 revisions was homeownership counseling. Previously, first-time homebuyers receiving counseling were eligible for a reduced upfront FHA insurance premium. While FHA permitted HUD-approved homeownership counseling programs, unacceptable practices were observed, such as borrowers simply being asked to complete homeownership workbooks without any additional interaction with the counseling program. The new rule required that the type of homeownership counseling obtained by first-time homebuyers must be examined by FHA's quality assurance staff as part of its regular reviews of lenders. FHA required that counseling be delivered in a classroom setting, face-to-face or via electronic media, and involve 15 to 20 hours of instruction. When the upfront premium was reduced in 2001 for all FHA borrowers, there was no longer a separate discount for borrowers who went through homeownership counseling programs. The discount is only required by law if FHA charges the maximum upfront premium.

3. Automated Underwriting Systems

In 1998, FHA approved Freddie Mac's Loan Prospector for underwriting FHA-insured mortgages. FHA also made a substantial number of revisions to its credit policies and reduced documentation requirements for loans assessed by Loan Prospector. This was the first time that FHA incorporated an automated underwriting system (AUS) in its insurance endorsement process. Fannie Mae's Desktop Underwriter and PMI Mortgage Services' pmiAURA were approved to underwrite FHA mortgages in 1999, followed soon thereafter by Countrywide Funding Corporation's CLUES and JP Morgan-Chase's Zippy. Beginning in May 2004, all approved AUSs applied FHA's Technology-Open-To-Approved-Lenders (TOTAL) mortgage scorecard to evaluate loan applications for possible automated approval for FHA insurance. Initially, more than two-thirds of loans submitted generally received automated approval, eliminating the need for manual underwriting reviews. Since May 2004, HUD required lenders

[1] Mortgagee Letter 2008-23, September 5, 2008: Revised Downpayment and Maximum Mortgage Requirements.
[2] Mortgagee Letter 2010-29, September 3, 2010: Minimum Credit Scores and Loan-to-Value Ratios.
[3] Mortgagee Letter 2012-03, February 28, 2012: Miscellaneous Underwriting Issues.

to submit borrower credit scores. As of July 2008, all loans must be submitted through FHA's TOTAL scorecard.

4. Changes in Mortgage Insurance Premiums

In response to the FY 2009 estimate that the capital ratio had fallen below the statutory two percent level, FHA made several changes to the mortgage insurance premium structure. Effective for the loans endorsed after April 5, 2010, FHA increased the upfront mortgage insurance premium from 1.75 percent to 2.25 percent.[4]

On Aug 12, 2010, Public Law 111-229 provided the Secretary of HUD with additional flexibility regarding the mortgage insurance premiums for FHA loans. Specifically, the law increased the upper limit of annual mortgage insurance premiums. Starting October 4, 2010,[5] the upfront premium was reduced to 1.00 percent for all mortgage types, while the annual premium for loans with 30-year terms was increased to 85 basis points for LTV ratios less than or equal to 95 percent, and to 90 basis points for LTV ratios exceeding 95 percent. For loans with 15-year terms, an annual premium of 25 basis points was charged on loans with LTVs higher than 90 percent. The annual insurance premium was further increased by another 25 basis point for all loans starting April 18, 2011.[6] On December 23, 2011, the President signed into law the Temporary Payroll Tax Cut Continuation Act of 2011 (Public Law 112-78), which included a provision that required FHA to increase the Annual MIP it collects by an additional 10 basis points (bps). This change was effective for case numbers assigned on or after April 9, 2012.[7] For loans exceeding $625,000, an extra 25 bps annual MIP was added starting June 11, 2012. The up-front premium was increased from 1 percent to 1.75 percent starting April 9, 2012. Certain exceptions were made for streamline refinance loans if the original FHA loan was endorsed on or before May 31, 2009 and starting with loan applications taken on June 11, 2012.

5. FHA Single-Family Loan Limits

In early March 2008, FHA announced a temporary loan limit increase as a result of the enactment of the Economic Stimulus Act of 2008 (ESA). The ESA provided that the mortgage limit for any given area shall be set at 125 percent of the median house price in that area, except that the FHA mortgage limit in any given area cannot exceed 175 percent of the 2008 Government Sponsored Enterprise (GSE)[8] conforming loan limit of $417,000, nor be lower than

[4] Mortgagee Letter 2010-02, January 21, 2010: Increase in Upfront Premiums for FHA Mortgage Insurance.
[5] Mortgagee Letter 2010-28, September 1, 2010: Changes to FHA Mortgage Insurance Premiums.
[6] Mortgagee Letter 2011-10, February 14, 2011: Annual Mortgage Insurance Premium Changes and Guidance on Case Numbers.
[7] Mortgage Letter 2012-04, March 6, 2012: Single Family Mortgage Insurance: Annual and Up-Front Mortgage Insurance Premium-Changes.
[8] The GSEs are Fannie Mae, Freddie Mac, and the Federal Home Loan Banks.

65 percent of the same 2008 GSE conforming loan limit for a single-family, one-unit residence. FHA's single-family national loan limit ceiling for 2008 was revised to $729,750. These loan limit increases were effective for mortgages endorsed for FHA insurance on or after March 6, 2008.[9]

Under HERA, the Federal Housing Finance Agency (FHFA) was established and directed to set GSE conforming loan limits each year for the nation as a whole, as well as for high-cost areas. HERA stipulated that the national loan limit for the GSEs during 2009 remain at $417,000. Effective January 1, 2009, and per HERA the FHA mortgage limit for any given area was set at 115 percent of the area median house price, with a ceiling of 150 percent of the GSE conforming loan limit, or $625,000.[10]

In February 2009, the FHA single-family loan limits changed as a result of the American Recovery and Reinvestment Act of 2009 (ARRA, February 17, 2009). Those limits were effective for loans with credit approved in calendar year 2009.[11] Under ARRA, the revised FHA loan limits for 2009 were set at the higher of the loan limits established for 2008 under ESA and those established for 2009 under HERA.

Under the authority of the Continuing Appropriations Act 2011, Public Law 111-242, the loan limits authorized by ARRA were extended to the end of FY 2011.[12] Since both the ESA and HERA set the FHA national loan limit floor at 65 percent, the FHA loan limit floor also remained at the FY 2009 level, $271,050. For the FHA national loan limit ceiling, the limit based on ESA (175 percent) was higher than that based on HERA (150 percent), and the national loan limit ceiling was set at $729,750, which was again the same as in the previous year. During October 1st, 2011, and November 18th, 2011, the national loan limit was reduced to $625,500, which was the same as the GSE's national limit.[13] The national loan limit for loans endorsed after November 18th, 2011 reverted to $729,750, which was higher than Fannie Mae's and Freddie Mac's conforming loan limit.[14]

6. Concentration of Loans with Downpayment Assistance in Recent Books

Non-profit-organization-assisted mortgages represented over twenty percent of the entire FY 2005, FY 2006, and FY 2007 books of business, and the percentage still exceeded fifteen percent in FY 2008. FHA guidelines allowed such borrowers to use outright gifts of cash as

[9] Mortgagee Letter 2008-06, March 6, 2008, Temporary Loan Limit Increase for FHA.
[10] Mortgagee Letter 2008-36, November 7, 2008, 2009 FHA Maximum Mortgage Limits.
[11] Mortgagee Letter 2009-07, February 24, 2009 Loan Limit Increases for FHA.
[12] Mortgagee Letter 2010-40, December 1, 2010: 2011 FHA Maximum Loan Limits.
[13] Mortgagee Letter 2011-29, August 19, 2011: Federal Housing Administration's (FHA) Maximum Loan Limits Effective October 1, 2011 through December 31, 2011.
[14] Mortgagee Letter 2011-39, December 2, 2011: Federal Housing Administration Maximum Loan Limits Effective October 1, 2011 through December 31, 2012

downpayment assistance.[15] A 2005 report by the Government Accountability Office (GAO) documented that many downpayment gifts provided by non-profit organizations were contributed by the home sellers involved in the specific transactions, and possibly through financing based on inflated house prices.[16] The Passage of HERA on July 30, 2008 officially terminated the eligibility of loans with seller-funded downpayment assistance for FHA endorsements. Afterwards, the originations of such loans diminished quickly and new endorsements with non-profit gifts have been virtually non-existent since the second quarter of FY 2009. The elimination of seller-financed downpayment assistance has had and will continue to have a significant effect in reducing losses on future FHA books, as previous Actuarial Reviews have quantified.

7. Foreclosure Avoidance and Loss Mitigation Program

One of the consequences of the severe housing recession has been the incidence of high foreclosure rates. FHA took actions to help families avoid foreclosure through loan modifications and partial claim initiatives, as well as default counseling provided by HUD-approved counseling agencies.

Since its introduction as a national program in 1994,[17] the pre-foreclosure sale (PFS) program has allowed mortgagors in default to sell their homes and use the sales proceeds in satisfaction of their mortgage debt even when the proceeds are less than the amount owed.[18] This approach has the benefit of reducing the total credit costs to FHA.

In 1996, as FHA terminated the loan assignment program, it also issued a series of initiatives to encourage servicers to apply various loss mitigation tools to avoid foreclosure.[19] This approach proved to be an effective way of keeping financially stressed borrowers in their homes and reducing credit losses. The implementation of loss mitigation tools ramped up quickly and became a significant part of FHA's risk management practices by FY 2002.

On May 20, 2009, President Obama signed into law the Helping Families Save Their Homes Act of 2009. The law permitted FHA lenders to offer families more substantial loan modifications

[15] Eligible gift sources included: relatives, employers or labor unions, tax-exempt charitable organizations, governmental agencies, public entities that have programs to provide homeownership assistance to low- and moderate-income families or first-time homebuyers, or close friends with a clearly defined and documented interest in the borrower.

[16] "Mortgage Finance Additional Action Needed to Manage Risks of FHA-Insured Loans with Downpayment Assistance," Government Accountability Office, November 2005.

[17] The regulations for the PFS Program are codified in 24 CFR 203.370.

[18] Mortgagee Letter 2008-43, December 24, 2008, Utilizing the PFS Loss Mitigation Option.

[19] Mortgagee Letter 96-25, May 8, 1996, Existing Alternatives to Foreclosure – Loss Mitigation; Mortgagee Letter 96-23, June 28, 1996, Loss Mitigation – Mortgage Modification; Mortgagee Letter 96-61, November 12, 1996, FHA Loss Mitigation Procedures – Special Instruction.

and provided FHA with additional loss mitigation authority to assist FHA mortgagors under the umbrella of the Home Affordable Modification Program (HAMP). Mortgagee letter 2009-23, effective August 15, 2009, announced an FHA Loss Mitigation option, or FHA-Home Affordable Modification Program (FHA-HAMP). FHA-HAMP provided opportunities to reduce mortgage payments of delinquent borrowers to sustainable levels. This program was designed to help FHA borrowers already in default or at "imminent" risk of default with opportunities to reduce payments by loan modification with principal deferment.

On March 26, 2010, HUD and the Department of the Treasury announced enhancements to the existing Making Home Affordable Program (MHA) and FHA refinance program that may give a greater number of responsible borrowers an opportunity to remain in their homes.[20] These enhancements are designed to maintain homeownership by providing borrowers, who owe more on their mortgage than the value of their home, opportunities to refinance into an affordable FHA loan. This opportunity allows borrowers who are current on their conventional mortgage to qualify for an FHA refinance loan provided that the lender or investor writes down the unpaid principal balance of the original first-lien mortgage by at least 10 percent and borrower payment ratios meet program requirements.

On August 15, 2011, FHA issued servicing guidelines requiring trial payment plans for loan modification and partial claim actions.[21] Loans with certain high-risk characteristics are required to complete a minimum of a three-month trial period before a permanent standard modification and/or partial claim can be granted.

The more recent changes to loan modification options and procedures have limited data available to assess their efficacy. Thus, the potential impacts of these programs were not incorporated into this Review.

C. Current and Future Market Environment

1. Interest Rates

Due to the current weak economy and the Fed's active monetary policies, the one-year Treasury rate has fallen to a historically low level: from 2.18 percent in Aug. 2008 to 0.24 percent in July 2012. Similarly, looking back two years, the ten-year Treasury yield also declined from 3.59 percent in Aug. 2009 to 2.01 percent in July 2012. The average conventional 30-year fixed-rate mortgage commitment rate posted by Freddie Mac also declined from 5.19 percent in Aug. 2009

[20] Mortgagee Letter 2010-23, August 6, 2010, FHA Refinance of Borrowers in Negative Equity Positions.
[21] Mortgagee Letter 2011-28, August 15, 2011, Trial Payment Plan for Loan Modifications and Partial Claims under Federal Housing Administration's Loss Mitigation Program.

and to 3.55 percent in July 2012. These realized 2012 rates are lower than the projected 2012 rates that were used in last year's Review.

We used stochastic, Monte Carlo economic projections in this year's Review to create a wide range of possible economic conditions for estimating the economic value of the Fund. These projections have been calibrated to center on Moody's baseline forecast in the sense that the simulated values are just as likely to be above Moody's baseline as they are to be below it. Moody's July 2012 economic forecast projected that future mortgage rates will steadily rise to 6.58 percent by Calendar Year (CY) 2014Q3, and then stabilize around 6.00 percent afterward. The one-year Treasury rate was projected to rise to 1.25 percent by CY 2014Q3, and the ten-year Treasury rate was projected to rise to 4.77 percent by CY 2014Q3. Moody's July 2012 forecasted rates for the one-year Treasury rate, the ten-year Treasury rate and mortgage rates are generally lower than those in the June 2011 forecast. [22] As will be shown later, this dramatically lower than last year forecasted interest rates during the 2012 to 2014 period has considerable negative impact to the economic value of the Fund.

Exhibit I-1 shows forecasts of the 10-year Treasury rate used in this year's and in the prior year's Reviews. The realized 10-year Treasury rates during the past year turned out to be much lower than what were forecasted in the previous year. This is likely due to the persistent economic recession and the extension of quantitative easing policies of the Federal Reserve Board.

[22] The July 2011 forecast was issued before the Fed policy announcement.

Exhibit I-1: 10-Year Treasury Rate Forecasts for the Current and Prior Review

	2011	2012	2013	2014	2015	2016	2017	2018	2019
July 11(Moody's)	3.41	4.85	5.66	5.01	4.91	5.04	5.04	4.93	4.81
July 12(Moody's)	2.79	2.05	3.25	4.59	4.70	4.90	4.93	4.91	4.91

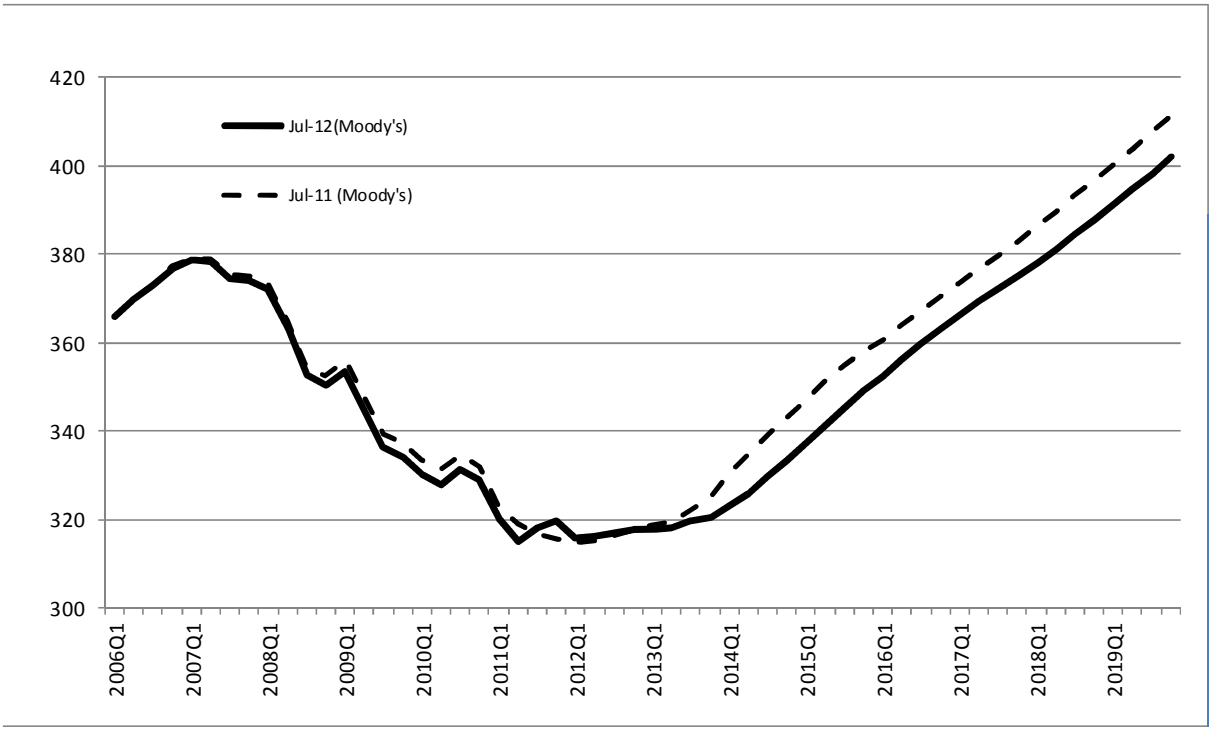
2. House Price Growth Rates

Our stochastic projections for future house price growth rates are centered on Moody's July 2012 forecast of FHFA house price indices. Moody's house price forecasts have the advantage that they provide forecasts at the local level, including metropolitan areas and states. Moody's publishes its forecasting methodology and provides a description of the rationale behind their assumptions. In addition to their base-case forecast, Moody's also provides several alternative scenarios, which we used in Section V.

The national FHFA house price growth rate has been negative since CY 2007Q3 (measured quarterly year over year). The national growth rate reached a trough of negative 6.55 percent in CY 2010Q1. Throughout 2011, the growth rate was in the negative 3-4 percent region (annualized), indicating further deterioration in the housing market.

Exhibit I-2 presents base-case national HPI forecasts used in this year's Review (Moody's) and in the last year. The HPI forecasts by Moody's this year are about the same in the near term compared to their July 2011 forecasts; but the HPI levels are now lower in FY 2015 and beyond. Based on Moody's July 2012 HPA forecast, we calculated the cumulative HPA for years 2011-2019. Comparing that with July 2011's forecast, the cumulative HPA will be about 2% lower for the updated forecast. To be shown later in this Review, the lower HPA in the next several years introduced a permanent impact of lower HPI, which leads to a considerable negative impact to the economic of the Fund.[23]

Exhibit I-2: House Price Index Forecasts made between 2011 and 2012



Cumulative HPA since 2006

	2011	2012	2013	2014	2015	2016	2017	2018	2019
July 11(Moody's)	-13.9%	-14.7%	-13.0%	-8.3%	-3.7%	-0.1%	3.3%	6.7%	10.3%
July 12(Moody's)	-14.0%	-14.5%	-13.8%	-11.0%	-6.4%	-2.2%	1.3%	4.5%	8.0%

[23] The HPA forecast is from Moody's FHFA all-transaction indices at national, state, and MSA level. The all-transaction indices show some different trend than the purchase-only indices in the recent two quarters, due to high HARP refinance activities.

The above exhibit shows the continued weakness of the FHFA all-transactions HPI over the past year. The forecast of future growth rates was lower than those of the prior year, implying that the housing market recession turned out to be deeper and longer than was expected. The continual worsening of house price growth rates has been the major contributor to the decrease in the economic value of the Fund during each of the past five years.

3. Mortgage Demand

FHA's market share has increased dramatically from its low of 2.4 percent in FY 2007. Before that time, FHA's market share declined in concert with the expansion of the subprime mortgage market (2003-2007). After the financial crisis of 2008, capital left the subprime mortgage market. Pprivate mortgage insurers also became capital-constrained after facing heavy losses. Thus, FHA has become the primary source for high-LTV lending, with a share of 15 percent to 17 percent of the entire single-family first-lien mortgage market during the past two years. Origination volume during FY 2009 reached a record high of $330 billion, up from $176 billion in FY 2008. The FY 2010 volume was $288 billion and the volume for FY 2011 was $214 billion. The estimate for FY 2012 volume is approximately the same of $212 billion.[24]

Any forecast of future FHA endorsement volumes depends critically on what the future holds for conventional mortgage lenders, private mortgage insurers, and Fannie Mae and Freddie Mac. If these institutions reestablish their prior roles and levels in the markets, FHA market share would likely revert to its historical norm of around 8 to 10 percent. With an assumed prolonged impairment of the role of other mortgage market institutions, we project the FHA market share to settle in around 15 percent of the total single-family mortgage market.

Forecasts of FHA endorsement volume also depend on the future trajectory of house prices and interest rates. For each simulated path of these economic variables we obtain a different projection of mortgage volume. Moody's July 2012 baseline scenario projects negative near-term house price growth at the national level and a near-term rapid rise in mortgage rates. These factors lead us to estimate a reduction of FHA volume to $153 billion in FY 2012. We then expect FHA endorsement volume to rebound to the $200 billion range for FY 2015 and beyond, given Moody's baseline scenario for the economy and the housing market.

[24] Based on FHA data warehouse as of the end of August 2012.

D. Structure of this Report

We again emphasize that the results reported in this Review pertain to the MMI Fund performance excluding HECMs.

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

Section II. Summary of Findings and Comparison with FY 2011 Actuarial Review – presents the Fund's estimated economic value and insurance-in-force for FY 2012 through FY 2019. This section also provides a reconciliation and explanation of the major differences between the FY 2011 and the FY 2012 Reviews.

Section III. Current Status of the MMI Fund – presents the estimated economic value and IIF for the Fund at the end of FY 2012 and provides an analysis of the performance of the FY 1982 through FY 2012 books of business.

Section IV. Characteristics of the Fiscal Year 2012 Insurance Portfolio – describes the FY 2012 insurance portfolio and compares the risk characteristics of the origination books of business across historical fiscal years.

Section V. Fund Performance under Alternative Scenarios – presents analyses of the Fund performance using a range of alternative economic environments.

Section VI. Summary of Methodology – presents an overview of the econometric and cash flow models used in the Review.

Section VII. Qualifications and Limitations – describes the main assumptions and the limitations of the data and models relevant to the results presented in this Review.

Section VIII. Conclusions – provides a summary of the report's results and the conclusions we draw from those results.

Appendix A. Econometric Analysis of Mortgage Status Transitions and Terminations – provides a technical description of our econometric models of claim and prepayment for individual mortgage product types.

Appendix B. Cash Flow Analysis – provides a technical description of our cash flow model.

Appendix C. Data for Loan Performance Simulations – explains the procedures used to transform the raw data into the data used to simulate future mortgage and Fund performance.

Appendix D. Economic Forecasts – describes the forecast of future economic factors that affect the performance of the Fund and the alternative economic scenarios underlying the selected sensitivity analyses.

Appendix E. Loss Severity Model – provides a technical description of our econometric model of FHA mortgage loss severity rates.

Appendix F. FHA Volume Model – explains our econometric model used to project future FHA loan volumes.

Appendix G. Stochastic Processes of Economic Variables -- provides a technical description of the econometric model developed to project house price appreciation, interest rate changes and unemployment rate changes into the future.

Appendix H. Historical and Projected Loan Termination Rates – contains historical and projected claim and prepayment rates.

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Section II: Summary of Findings and Comparison with FY 2011 Actuarial Review

This section presents the economic value and insurance in force of the Fund[25] for FY 2012 and provides an explanation of how the economic value of this year's Review compares with that of the FY 2011 Review.

A. The FY 2012 Actuarial Review

This FY 2012 Actuarial Review estimates the economic value of the Fund as of the end of FY 2012 (September 30, 2012) and projects the status of the Fund through FY 2019. The objectives of our analysis include:

- Evaluating the historical experience of the Fund, including loan termination experience due to claims and prepayments, and losses associated with claims;
- Projecting future loan termination rates and their corresponding cash flows of the existing Fund portfolio and of future books of business; and
- Estimating the economic value and the insurance-in-force of the Fund.

We conducted this review by analyzing the historical loan performance using data provided by FHA, developing econometric models and estimating their parameters and forecasts of future economic conditions. The econometric models were used to project the future cash flows of the Fund and their present value was combined with estimates of capital resources to estimate the economic value of the Fund.

The econometric models are similar in many respects to those of the FY 2011 Review, but with some major enhancements implemented for the current Review. These enhancements include:

- Monte Carlo simulations of future interest rates, house prices, unemployment rates, and the associated computation of the Economic Value of the Fund.
- Transition Model improvements: we added transitions to identify streamline refinance from other prepayments, and identify default cures by heavy modification from cures by light or no modification.
- Loss Severity Model improvements: we introduced a binomial logistic model to predict the probability of property conveyance to HUD, *i.e.*, real estate owned (REO), vs. pre-foreclosure sales (PFS); and separate loss given default (LGD) models were developed to estimate the loss severity, depending on the claim type.

[25] The Fund in this Review refers to the MMI Fund excluding HECMs.

The performance of the MMI Fund loans during the recent housing recession enabled us to refine the econometric estimation results, especially for the most-stressed regions. The loan-level status transition data during the recent severe house price declines made possible more accurate estimation of the model coefficients in this stressful environment.

The estimation of the loan status transition models utilizes loan-level data on the Fund's experience reported by HUD beginning in FY 1996 and extending through the second quarter of FY 2012.

Appendices A through H describe the individual models in detail, the assumptions, and econometric results. Our main findings are as follows:

- As of the end of FY 2012, the Fund is projected to have an estimated economic value of ***negative*** **$13.48 billion**, an unamortized insurance-in-force of $**1,126.27 billion**, and an amortized insurance-in-force of $**1,053.33 billion**.

- The FY 2012 book of business is projected to contribute an estimated $**11.92 billion** in present value to the economic value of the Fund.

Our current projections indicate that the Fund's economic value will increase in the future, rising by an average of $9.68 billion per year through FY 2019. With the expected slower prepayment rates of the existing books of business implied by the rapidly rising projected interest rates, along with the continuation of a high FHA market share, the IIF will increase by an average rate of 3.79 percent per year through FY 2019. The economic value is expected to grow at a substantially faster rate than that of the IIF. Exhibit II-1 provides estimates of the Fund's economic value and IIF through the end of FY 2019. In summary, the economic value is projected to steadily increase over the next 7 years to reach $54.25 billion by the end of FY 2019.

Based on Moody's forecast of rapid rising interest rates in 2013-2015, new endorsements for FY 2014-2015 were projected to drop during that period because of low volume of refinance activities. After the rates stabilize in 2016 and start to drop again in 2016-2017, we project that the new endorsements would start increase again after FY 2016.

Exhibit II-1: Projected Fund Performance for FY 2012 to FY 2019 ($ Millions)

Fiscal Year	Economic Value of the Fund[a]	Unamortized Insurance in Force[b]	Amortized Insurance in Force[b]	Economic Value of Each New Book of Business	Volume of New Endorse-ments[c]	Investment Earnings on Fund Balances
2012	-13,478	1,126,267	1,053,329	11,922	211,737	
2013	-2,585	1,223,784	1,136,509	10,987	219,605	-95
2014	4,223	1,291,771	1,186,208	6,845	167,031	-37
2015	11,525	1,317,205	1,194,820	7,222	176,024	80
2016	20,984	1,353,817	1,217,462	9,163	221,233	296
2017	31,352	1,399,213	1,248,114	9,698	231,621	670
2018	42,502	1,436,476	1,269,906	9,988	235,533	1,162
2019	54,251	1,458,771	1,277,260	9,989	242,660	1,760

[a] All values are as of the end of each fiscal year. The economic value for FY 2012 through FY 2019 is equal to the economic value of the Fund at the end of the previous year, plus the current year's interest earned on the previous Fund economic value, plus the economic value of the new book of business.
[b] Estimated based on the data extract as of March 30, 2012 and projections of new endorsements and loan performance.
[c] Based on our volume forecast.

B. Change in the Economic Value of the Fund

Exhibit II-2 displays the components of the Fund's current economic value, with comparisons between values in the FY 2011 and FY 2012 Reviews. The FY 2011 Review estimated that the Fund had $1.19 billion in economic value at the end of FY 2011 to cover future unexpected claim losses.

FHA estimated that the Fund has total capital resources of $25.57 billion at the end of FY 2012. The present value of future cash flows is estimated to be ***negative*** $39.05 billion. Thus, as of the end of FY 2012, the Fund is projected to have ***negative*** $13.48 billion in economic value.

Exhibit II-2: Estimates of Fund Economic Value as of the End of FY 2012 ($ Millions)

Item	End of FY 2011[a]	End of FY 2012
Cash	$25,532	
Investments	4129	
Properties and Mortgages	2458	
Other Assets and Receivables	18	
Total Assets	$32,137	
Liabilities	(4,228)	
Total Capital Resources	$27,909	
Net Gain from Investments		2,272 [b]
Net Insurance Income in FY 2012		(5,429)[c]
Net Change in Properties and Mortgages		(454)[b]
Net Change in Accounts Payable		156[b]
Settlement Funds		1,120[b]
Total Capital Resources		**25,574**
PV of Future Cash Flows on Outstanding Business		(39,052)
Economic Value	**$ 1,193** [d]	**(13,478)**
Unamortized Insurance-In-Force	1,069,354 [d]	1,126,267
Amortized Insurance-In-Force	1,009,154 [d]	1,053,329

[a] Source: Audited Financial Statements for FY 2011.
[b] Estimated based on unaudited investment income provided by FHA.
[c] Estimated based on unaudited net non-HECM operating cash flow through end of July 2012 provided by FHA and FHA-projected net cash flow for the remaining two months.
[d] From the FY 2011 Actuarial Review.

As seen in Exhibit II-2, the estimated FY 2012 economic value of the Fund decreased by $14.67 billion from the FY 2011 level of $1.19 billion to ***negative*** $13.48 billion. The IIF increased by 5.32 percent – from $1,069.35 billion to $1,126.27 billion. The change in the estimated economic value represents the net impact of several significant factors, which are described in detail below.

C. Sources of Change from the FY 2011 Review to the FY 2012 Review

This section describes the sources of change in estimates of economic value between the FY 2011 Review and the FY 2012 Review for FY 2012 and FY 2018. Separating out the specific impacts of interrelated approaches and assumptions can be done only up to a certain degree of accuracy. The interdependency among the various components of the analysis prevents us from identifying and analyzing these as purely independent effects. Furthermore, the order in which we do the analysis affects the results. With these caveats, this section presents an approximate decomposition of differences in the FY 2012 and FY 2018 economic values from those presented in the FY 2011 Review, by source of change.

1. Change in Economic Value from FY 2011 to FY 2012

The FY 2011 Review estimated the economic value of the Fund as of the end of FY 2011 to be $1.19 billion, and the projected FY 2018 economic value to be $59.45 billion. In this Review, we estimate the end-of-FY 2012 economic value for the Fund to be ***negative*** $13.48 billion, which represents a decrease of $14.67 billion from the FY 2011 economic value reported in the FY 2011 Review. This is a significant decrease in the estimated economic value of the Fund. Accompanying this decrease in economic value is an increase in the unamortized IIF of 5.32 percent.

2. Current Estimate of FY 2012 Economic Value Compared with the Estimate Presented in the FY 2011 Actuarial Review

The FY 2011 Review projected that the FY 2012 investment earnings on Fund balances and the present value of the FY 2012 book of business would add $0.01 billion and $8.15 billion, respectively, to the economic value of the Fund, resulting in a projected FY 2012 economic value of $9.35 billion. As shown in Exhibit II-2, with the updated financial statements and data extract we now observe the end-of-FY 2011 capital resources to be $27.91 billion and estimate the net sources/uses of funds in FY 2012 to be *negative* $2.34 billion, thus the estimated end-of-FY 2012 capital resources is $25.57 billion. Details on the net income in FY 2012 are provided in Section III of this Review. Combining this estimate of capital resources with the estimated present value of future cash flows of the outstanding portfolio of *negative* $39.05 billion, this year's estimate of the FY 2012 economic value is *negative* $13.48 billion. Thus, this year's estimate of the FY 2012 economic value is $22.83 billion lower than the economic value of $9.35 billion projected for FY 2012 in last year's Review, as shown in Exhibit II-3.

Exhibit II-3 also provides a summary of the decomposition of changes in the current economic value of the Fund as of the end of FYs 2012 and 2018 from the FY 2011 Review as compared to the FY 2012 Review. The overall net change in economic value, reflecting several offsetting factors, is negative for both FY 2012 and for FY 2018.

Exhibit II-3: Changes in Fund Estimated Economic Value Between FY 2011 and 2012 ($ Millions)

	Change in FY 2012 Economic Value	FY 2012 Economic Value[a]	Change in FY 2018 Economic Value	Corresponding FY 2018 Economic Value[b]
FY 2011 Economic Value Presented in the FY 2011 Review		$1,193		
FY 2012 Economic Value Presented in the FY 2011 Review, Excluding the FY 2012 Book of Business	$6	$1,199		
Plus: Forecasted Economic Value of FY 2012 Book of Business Presented in the FY 2011 Review	$8,152			
Equals: FY 2012 Economic Value Presented in the FY 2011 Actuarial Review		$9,351		$59,448
Plus: a. Settlement Fund	$1,120	$10,471	$1,279	$60,727
Plus: b. Update volume of FY 2011-2012 books	$3,255	$13,726	$3,898	$64,625
Plus: c. Update volume forecast of FY 2013 and later books	$0	$13,726	$3,959	$68,584
Plus: d. Update loan-status transition models	($748)	$12,978	($7,003)	$61,581
Plus: e. Introduce claim type (REO vs. PFS) prediction model	($5,039)	$7,939	($6,456)	$55,125
Plus: f. Update loss severity rate models	($5,238)	$2,701	($8,220)	$46,905
Plus: g. Update actual performance in FY 2011-2012 and portfolio composition	$539	$3,240	($1,913)	$44,992
Plus: h. Update economic trend forecast - interest rate	($8,026)	($4,786)	($17,612)	$27,380
Plus: i. Update economic trend forecasts - house price growth rate	($10,534)	($15,320)	($6,889)	$20,491
Plus: j. Update discount factors	($1,074)	($16,394)	$389	$20,880
Plus: k. Apply new insurance premium schedule	$138	($16,256)	$12,914	$33,793
Plus: l. Special adjustment for asset sales	$1,227	($15,028)	$1,404	$35,197
Plus: m. Special adjustment for delayed claims	($1,236)	($16,265)	($1,412)	$33,785
Plus: n. Implement stochastic interest rate simulation	$1,677	($13,352)	$8,450	$43,647
Plus: o. Implement stochastic house price growth rate simulation	($127)	($13,478)	($1,145)	$42,502
Equals: Estimate of Economic Value	($22,829)	($13,478)	($16,946)	$42,502

[a] Shows the progression of economic values as of the end of FY 2012 as incremental changes are made.
[b] The FY 2018 economic values are the latest year that can be directly compared between the FY 2011 and FY 2012 Reviews.

3. Decomposition of the Differences in Economic Value of the Current Review versus the FY 2011 Review

We now present a step-by-step analysis of the differences between the FY 2011 and FY 2012 Reviews, shown in Exhibit II-3.

a. Settlement Funds

In 2012, FHA received settlement funds with a total amount of $1.12 billion from multiple mortgage lenders. This settlement is a part of the global resolution between the Federal Government and the five largest mortgage servicing banks.[26] As a result, the estimated FY 2012 economic value increased by $1.12 billion.

b. Update Origination Volume of FY 2011 and FY 2012

The second component of change depicted in Exhibit II-3 relates to the updated origination volume and composition for the FY 2011 and FY 2012 books of business. The actual realized origination volume of the FY 2011 book and updated estimate of the FY 2012 book as of September 2012 are larger than what were projected in last year's Review. The greater realized volume caused an increase of $3.26 billion in the estimated FY 2012 economic value. The projected economic value due to the updated volume and composition projections through FY 2018 were also higher.

c. Update Volume Forecast of FY 2013 and Later Books of Business

The third element of change in Exhibit II-3 is the change in the forecasted FHA endorsement volume of FY 2013 and later books of business. This step has no impact on the estimated FY 2012 economic value, but increases the estimated FY 2018 economic value by $3.96 billion.

d. Update Loan-Status Transition Models

As a result of our continuing effort to improve the accuracy of the analysis, several major model enhancements were implemented this year. The major model changes include: (1) model structure update; (2) addition of new explanatory variables; (3) new specifications of existing variables.

The transition model has been changed as follows:

- Separately identifying streamline refinance from conventional refinance transitions

[26] http://www.justice.gov/usao/nye/pr/2012/2012feb09.html

- Separating default to cure transition into cures with heavy modifications (including partial claims), and cures with light or no modifications (including repayment plans)

We also added the following new variables into the transition models:

- Local Unemployment Rate
- Local Home Price Appreciation
- Local Home Price Volatility
- Debt-to-Income Ratio
- Current Loan-to-Value Ratio
- Relative Loan Size
- Spread at Origination
- Credit Burnout
- Property Type

For the following existing variables, we changed the specification from categorical to splines:

- Borrower Credit Score
- Mortgage Spread
- Yield Curve Slope
- Prepayment Burnout Factor
- Probability of Negative Equity

For details about these model enhancements, refer to Appendix A: Econometric Analysis.

The above led to lower estimated FY 2012 and FY 2018 economic values. These and other modeling changes led to a decrease in estimated economic value in FY 2012 by $0.75 billion, and an decrease in estimated economic value of $7.00 billion in FY 2018.

e. Introduce Claim Type Prediction Model

We made major enhancements to the loss severity model this year. These enhancements included:

- A binary logistic model to predict the percentage of claims that go to REO from those that have pre-foreclosure sales (PFS)
- Conditional loss-given-default (LGD) model for REO claims
- Conditional LGD model for PFS claims
- New specifications for key model variables

The claim-type prediction model is used to separate REO claims and PFS claims. The impact of this change is a decrease of $5.04 billion in the estimated FY2012 economic value and decrease of $6.46 billion in the estimated FY2018 economic value. In the FY 2011 Review, we used

historical average claim rates between REOs and PFSs to forecast future years. In recent years, the overall delay in claims decreased REO claim counts more than PFS claim counts. Since REO claims have a much higher loss rate than PFS claims, the result could lead to a downward bias in overall loss rates. To avoid this potential bias, this year we estimate REO and PFS claims separately using a more sophisticated approach that will not be biased by the claims delay. As a result, we forecast more REO claims relative to PFS claims, which results in a higher overall estimated loss rate.

f. Update Loss Rate Models

We made modifications to the loss rate models to increase precision in stressful environments. The main change was to use continuous spline functional forms to replace categorical variables for CLTV. The impact of this change is a further decrease of $5.24 billion in the estimated FY 2012 economic value and a decrease of $8.22 billion in the estimated FY 2018 economic value.

In previous years' Reviews, due to the thin sample of very high CLTV observations, it was not feasible to derive reliable statistics estimations for extrapolation beyond 100 percent CLTV. As a result, all 100 percent CLTV loans were grouped together to achieve an estimation of their impact on loss rate. Given the substantial increase during the last year in loans with CLTVs above 100 percent, we were able to obtain statistically meaningful coefficients of loss rate for loans of 100 percent or higher CLTVs. Thus, we implemented the CLTV variable in a way that removed the cap on the CLTV effect. This results in a substantial increase in the estimated loss rate relative to the FY 2011 Review approach.

g. Update Actual Performance in FYs 2011-2012 and the Portfolio Composition

The impact of this component is a small increase of $0.54 billion in the estimated FY 2012 economic value, and a reduction of $1.91 billion in the estimated FY 2018 economic value.

h. Updated Economic Forecasts – Interest Rates

The mortgage interest rate dropped by almost a full percentage point since summer 2011. This is opposite to Moody's July 2011 forecast, where the interest rates were forecasted to rise sharply after FY 2011 Q3. As shown in the low interest scenario sensitivity analysis of the 2011 Review, an extended low interest rate environment tends to adversely impact the Fund's economic value. The change of interest rate forecast also has two different types of impact on the FHA portfolio. First, based on Moody's 2011 forecast, the market interest rate would have risen sharply during FY 2012 and reach the peak of 5.56 percent in FY 2013. Under such a fast rising rate environment, interest rates on mortgages originated in FY 2008 to FY 2011 would be significantly lower than the market. The present value of the below market rate mortgages would have been lower than their outstanding balance. Borrowers would have incentive to keep

their mortgages by avoiding default. But the interest rate actually dropped significantly during FY 2012. Instead of having below market rate mortgages, borrowers of the FY 2008 to FY 2011 originated loans now are paying higher than market rates. The present values of these above market rate mortgages are now higher than their outstanding balances, which implies higher effective loan to value ratios. The incentive of avoiding default as suggested by Moody's 2011 interest rate forecast is now replaced by deeper in-the-money default option. As a result, much higher default rates are projected for these mortgages endorsed during the past several years. Second, the lower interest rate environment realized in FY 2012 and projected by Moody's for FY 2013 and FY 2014 would induce higher prepayment and reduce the future mortgage insurance premium stream, which implies lower overall revenue from the existing insured portfolio.

The increase in prepayment resulted in a reduction of $2.58 billion in the present value of mortgage insurance premium. Meanwhile, the risen claim loss led to a reduction in present value by $5.43 billion. Combining these two reductions in FY 2012 present values, the negative effect of interest rate changes in the economic forecast caused estimated FY 2012 economic value to drop by $8.03 billion, and the FY 2018 economic value to decrease by $17.61 billion.

i. Updated Economic Forecasts – House Price Growth Rate

Compared to its July 2011 forecast, Moody's Analytics' July 2012 local house price growth rate forecast is more pessimistic in the short run. In fact, Moody's July 2012 house price index forecast is very similar to the alternative scenario called "mild second recession" they published in July 2011. The difference is that the 2011 "mild second recession" has a deeper short-term HPA drop in 2012, but rebounded back to exceed the July 2012 forecast by 2014 and stayed higher thereafter. In the sensitivity analysis included in the FY 2011 Review, the FY 2012 economic value was estimated to be -$12.78 billion under that "mild second recession scenario", similar to the economic value of -$14.42 billion in this year's Review. The change in the home price forecast has a two-fold impact: 1) loans will accumulate equity slower, which will hinder their prepayments out of the FHA portfolio and prolong the annual premium cash flow; 2) loans are more likely to experience negative equity and claims are more likely to happen with deeper loss severity. The reduction in prepayment increased the present value of annual insurance premium by $2.44 billion, while the increasing default risk added the present value of claim loss and loss mitigation cost by $12.99 billion. These offsetting effects yielded a net impact of the change in house price growth rate forecast reduced the FY 2012 economic value by $10.53 billion, and the FY 2018 economic value by $6.89 billion.

j. Update FY 2012 Discount Factors

The Office of Management and Budget (OMB) discount factors are used to discount the projected cash flows to their present values. The OMB FY 2012 discount factors continue to

reflect a low interest rate environment. Updating the discounting factors caused the estimated FY 2012 economic value to decrease by $1.07 billion and the estimated FY 2018 economic value to increase by $0.39 billion.

k. Premium Changes in FY 2012

In addition to the mortgage insurance premiums (MIPs) outlined in last year's Review, further changes have been imposed. On December 23, 2011, the President signed into law the Temporary Payroll Tax Cut Continuation Act of 2011 (Public Law 112-78), which required FHA to increase the Annual MIP by 10 basis points (bps). This change is effective for case numbers assigned on or after April 9, 2012.[27] For loans exceeding $625,000, a 25 bps annual MIP was added starting June 11, 2012. The up-front premium was increased from 1 percent to 1.75 percent, also starting April 9, 2012. Exceptions were made for streamline refinance loans when the original FHA loan was endorsed on or before May 31, 2009. For these exception cases, the up-front MIP is as low as 0.01 percent (1 basis point). The higher annual MIP would increase the cash inflows of newer books of business. However, it could also slow down the prepayment rates of existing books of business, which could mean longer annual premium income stream, but could also expose larger number of loans to claim risk, leading to increased claim losses.

These changes in mortgage insurance premiums were imposed on all loans originated in estimated FY 2012 Q3 and later. The new annual mortgage premium structure led to an increase in the estimated FY 2012 economic value of $0.14 billion, and an increase in the estimated FY 2018 economic value of $12.91 billion.

l. Special Adjustment for Asset Sales

In a June 8 press release[28], HUD announced the Distressed Asset Securitization Program. "*Under the program, FHA-insured notes are sold competitively at a market-determined price generally below the outstanding principal balance. Once the note is purchased, foreclosure is delayed for a minimum of six additional months as the borrower gets direct help from their servicer to help to find an affordable solution to avoid foreclosure.*"

Subsequently, on a July 18 press release[29], HUD secretary stated that "*…we are increasing the number of loans beyond our original goals of 5,000 per quarter to approximately 9,000 this quarter. Providing the opportunity for borrowers to potentially stay in their home under a new*

[27] Mortgage Letter 2012-04, March 6, 2012, Single Family Mortgage Insurance: Annual and Up-Front Mortgage Insurance Premium-Changes.
[28] HUD Press Release No. 12-096, June 8, 2012, HUD to Expand Sale Of Troubled Mortgages Through Program Designed to Help Borrowers Avoid Costly, Lengthy Foreclosures.
[29] HUD Press Release No. 12-116, July 18, 2012, HUD Accepting Applications for Entities to Purchase Troubled Mortgages, Offer Chance to Avoid Costly Foreclosures and Stabilize Neighborhoods.

sustainable mortgage or other meaningful help not only benefits that homeowner but reduces the costs to FHA and ultimately benefits the entire community."

As this Review was produced, FHA has already completed two bulk sale auctions under this program. Based on the recovery price, the loss severity realized in these two auctions is roughly 80 percent of otherwise similar REO sales. In the meantime, several other similar NPL pools are under active discussion and preparation to be auctioned during the next several quarters.
To capture the possible impact of this distressed asset securitization program, we assume that these loans will be claimed over the next two years. We assume that approximately 20 percent of the model projected REO liquidations would take the form of asset sales instead of foreclosure and the loss rate of the asset sales will gradually converge to the loss rates on REO dispositions during the next two years. Based on these assumptions, the distressed asset securitization program is estimated to increase FY 2012 economic value by $1.23 billion and increase FY 2018 economic value by $1.40 billion.

m. Special Adjustment for Delayed Claims

Our model projected significantly more claims than actually occurred during the FY 2009 to FY 2012 time period. This is a consequence of servicers delay in the foreclosure process and in filing claims since late FY 2009. As a result of this delayed claim phenomenon, there is an unusually large inventory of loans deep into the foreclosure process or even completed auctions but no claims have been filed when this Review was prepared. These loans in foreclosure process should have already been claimed by now in a normal market operation. But due to the recent delayed claim phenomenon, they continue to remain in the Fund as NPLs and no losses have been recorded yet. We projected the industry will accelerate the claim filing process to reduce these excessive foreclosure inventory. To reflect this effect, we identified 56,477 loans that have already been in serious delinquency for over three years and have already entered foreclosure process, but have not yet filed claims. We assume that all these loans will be claimed between FY 2013 Q3 and FY 2014 Q4 with a loss rate similar to REO claims. This adjustment brings the foreclosure inventory back to the equilibrium level by the end of FY 2014.The adjustment for delayed claims resulted in a $1.24 billion reduction in estimated economic value in FY 2012 and a $1.41 billion reduction in FY 2018.

n. Implement Stochastic Interest Rate Simulation

As discussed in Appendix H, this year, for the first time, we used a stochastic method to estimate present values (PVs) of future cash flows. In previous Reviews, the present values of the cash flows were computed along a single, deterministic path of house prices and interest rates. Instead of a single path, we generated 100 equally likely paths to conduct a Monte Carlo simulation, and computed the present value of the cash flows for each of them. Then we averaged these 100

numbers to obtain our estimate of the expected PV of the future cash flows under our simulation procedure.

In order to better understand the different impacts of various stochastic macroeconomic drivers, we separate the stochastic simulation into two steps: 1) stochastic interest rates and deterministic house price simulation; 2) both interest rates and house price are stochastically simulated.

The first step of adopting stochastic simulation of interest rates improves the FY 2012 economic value by $1.68 billion. The FY 2018 economic value increases $8.45 billion. The intuition for this result is that when interest rates fall as happened in nearly half of the paths in the Monte Carlo simulation, the mortgages prepay, which reduces future premiums and also produces higher conditional default rates due to adverse selection (since the better-quality loans tended to prepay). When interest rates rise as happened in slightly more than half of the paths in the simulations, future premiums are retained since the prepayment rate is low, and default rates are lower because low mortgage contract rates relative to market rates create implicit equity. The increase in economic value when rates rise is greater than the reduction when rates fall, so the 2012 economic value improved.

o. Implement Stochastic House Price Growth Rate Simulation

The second step of incorporating the stochastic house price appreciation rates brought down the FY 2012 economic value by $0.13 billion, and the FY 2018 economic value decreases by $1.15 billion.

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Section III: Current Status of the MMI Fund[30]

As of the end of FY 2012, the Fund has an estimated economic value of *negative* $13.48 billion. The estimated economic value at the end of FY 2011 was $1.19 billion. The current estimated economic value is $14.67 billion lower than what it was at the end of FY 2011, and $22.83 billion lower than the $9.35 billion economic value projected in the FY 2011 Review. At the same time, the unamortized IIF of the Fund increased 5.32 percent, from $1,069.35 billion in FY 2011 to $1,126.27 billion in FY 2012.

In this section, we present an analysis of the Fund's current status. The analysis examines the status of the Fund at the end of FY 2012 and the projected future performance of new books of business through FY 2019. This section describes the basic components of the Fund's economic value and how they are expected to change through FY 2019.

A. The Current Economic Value of the Fund

According to the NAHA legislation, the economic value of the Fund is defined as the "cash available to the Fund, plus the net present value of all future cash inflows and outflows expected to result from the outstanding mortgages in the Fund." We base our estimate of this value on the level of capital resources projected for the end of FY 2012, plus the present value of expected future cash flows of the existing loan portfolio as estimated by our financial models. This year we projected the cash flows based on a Monte Carlo simulation of 100 possible future economic scenarios that are centered on Moody's baseline economic projections. Our estimate was computed as the average economic value from each of these 100 simulated paths. See Appendix H for more detail about this stochastic Monte Carlo approach.

The present value of expected future cash flows is calculated based on a financial model that uses the most current information available to estimate future cash flows. Cash inflows include upfront and annual premiums and projected investment income. Cash outflows include net claim losses, premium refunds, and loss mitigation expenses. These calculations include all cash flows that occur from the valuation date to the termination of the loan or the scheduled maturity (*e.g.*, 30 years for 30-year mortgages).

1. Capital Resources

[30] The MMI Fund in this Review refers to MMI Fund excluding HECMs.

Capital resources are the net assets of the Fund that, if necessary, could be converted into cash to meet the Fund's obligations, including payment of claims as they arise. They are computed by subtracting total liabilities from total assets. The assets consist of cash, Treasury investments, properties and mortgages, other assets and miscellaneous receivables net of payables. Exhibit III-1 indicates that the Fund's audited capital resources at the end of FY 2011 was $27.91 billion.

The next step in estimating the capital resources as of the end of FY 2012 is to estimate the sources and uses of funds generated by the Fund so as to compute the net change in funds over the year. These include the following five factors:

(1) Net gain/loss from investment: FHA estimates a net gain of $2.27 billion for FY 2012.
(2) Net insurance cash flow: FY 2012 net insurance cash flow was estimated by combining FHA's reported net cash flow for the period from October 2011 through July 2012 with FHA's projected August and September 2012 net cash flows. The net cash flows are computed as the sum of upfront and annual premium revenues, claim loss payments, premium refunds, and loss-mitigation-related expenses, with the last three being negative cash flows. The resulting insurance-related cash flow for FY 2012 was estimated to be *negative* $5.43 billion.
(3) Change in real estate owned (REO) inventory was estimated to decrease by $0.45 billion in FY 2012.
(4) An estimated net change in accounts payable of $0.16 billion.
(5) Cash settlements totaled $1.12 billion with the five largest mortgage servicers.

From these five factors the change in capital resources for the year is *negative* $2.34 billion. As a result, the capital resources of the Fund as of the end of FY 2012 were estimated to be $25.57 billion.

Exhibit III-1: Estimate of Fund Economic Value as of the End of FY 2012($ Millions)

Item	End of FY 2011[a]	End of FY 2012
Cash	$25,532	
Investments	4,129	
Properties and Mortgages	2,458	
Other Assets and Receivables	18	
Total Assets	$32,137	
Liabilities	(4,228)	
Total Capital Resources	$27,909	
Net Gain from Investments		2,272 [b]
Net Insurance Income in FY 2012		(5,429)[c]
Net Change in Properties and Mortgages		(454)[b]
Net Change in Accounts Payable		156[b]
Settlement Funds		1,120[b]
Total Capital Resources		**25,574**
PV of Future Cash Flows on Outstanding Business		(39,052)
Economic Value	**$ 1,193** [d]	**(13,478)**
Unamortized Insurance-In-Force	1,069,354 [d]	1,126,267
Amortized Insurance-In-Force	1,009,154 [d]	1,053,329

[a] Source: Audited Financial Statements for FY 2011.
[b] Estimated based on unaudited financial statements for FY 2012 provided by FHA.
[c] Estimated based on unaudited net non-HECM operating cash flow through end of July 2012 provided by FHA and projected net cash flow for the remaining two months
[d] From the FY 2011 Actuarial Review.

2. Present Value of Future Cash Flows in FY 2012 and Future Years

The present value of future cash flows of the Fund is aggregated from separate estimates of the present value of future cash flows from each book of business and for each of the six major mortgage product types. Exhibit III-2 shows the present values of future cash flows for each of the six mortgage product types from the FY 1983 through the FY 2012 books of business that have survived to the end of FY 2012. The present values are computed from the projected cash flows occurring during FY 2013 and future years. They are computed by taking the average over a set of simulated economic scenarios. This exhibit is offered to facilitate comparison among books of business and mortgage types based on cash flows that have not yet been realized as of the end of FY 2012. From Exhibit III-2, the total present value of these future cash flows is *negative* $39.05 billion. Compared to the corresponding figure estimated in the FY 2011 Review, the current liability increased by $12.06 billion.

The sharply negative house price growth rates since the Fall of 2007 suggest that in general mortgages originated during the years from 2005 to 2009 are likely to face higher claim rates during the next few years. Given that their upfront premiums were already collected and included as part of the current capital resources, and due to their large origination volume, the FY 2008 and FY 2009 books will generate large negative cash flows in the future. Exhibit III-2 indicates that both the FY 2008 and FY 2009 books are likely to experience the largest negative present values of any other book, *negative* $13.27 billion and *negative* $12.22 billion, respectively.

Exhibit III-2: Present Value of Future Cash Flows by Origination Fiscal Year & Mortgage Type as of the End of FY 2012($ Millions)

Fiscal Year	FRM 30	FRM 15	ARM	SR 30	SR 15	SR ARM	Total
1983	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0
1986	-2	0	0	0	0	0	-2
1987	-4	0	0	0	0	0	-4
1988	-3	0	0	0	0	0	-4
1989	-5	0	0	0	0	0	-5
1990	-7	0	0	0	0	0	-8
1991	-9	0	-1	0	0	0	-10
1992	-12	0	-3	-2	0	0	-18
1993	-2	0	-1	-12	0	-1	-15
1994	-4	0	-4	-20	0	-2	-29
1995	-14	0	-6	-2	0	0	-22
1996	-35	0	-11	-7	0	-1	-53
1997	-52	0	-22	-3	0	-1	-78
1998	-114	0	-14	-22	0	-2	-151
1999	-226	0	-11	-47	0	-3	-288
2000	-299	0	-35	-6	0	-4	-344
2001	-631	0	-16	-110	0	-6	-763
2002	-976	-1	-72	-184	-1	-33	-1,267
2003	-1,749	-2	-74	-797	-3	-59	-2,685
2004	-2,442	-4	-198	-457	-2	-98	-3,202
2005	-2,120	-5	-250	-321	-1	-72	-2,770
2006	-3,048	-10	-92	-178	-1	-7	-3,336
2007	-4,736	-20	-61	-234	-1	-4	-5,056
2008	-12,046	-66	-174	-949	-4	-34	-13,273
2009	-7,780	-66	-149	-4,070	-14	-138	-12,217
2010	-1,964	-32	-444	-1,511	-9	-341	-4,302
2011	3,447	-6	-127	82	-1	-217	3,178
2012[a]	6,905	103	-5	774	11	-118	7,670
Total[b]	-27,929	-111	-1,770	-8,076	-25	-1,142	-39,052

[a] Based on projected volume as of August 2012 and HUD's origination composition distribution forecasts.
[b] Numbers may not add up due to rounding errors.

3. Amortization of Current Books of Business

Both the unamortized and the amortized IIF are presented in this Review. Exhibit III-3 shows the total volume of new mortgage endorsements for each book of business, the unamortized IIF and the amortized IIF as of the end of FY 2012.

As can be inferred from Exhibit III-3, the FY 2009, FY 2010, FY 2011, and FY 2012 books of business constitute approximately 19.4, 21.3, 16.5 and 18.4 percent of the Fund's total end of FY 2012 amortized IIF, respectively. Mortgage endorsements declined significantly after FY 2003 as the subprime market expanded. FHA endorsements, however, have increased rapidly since FY 2007. As the housing market deteriorated, mortgage default rates skyrocketed and most private lenders tightened their underwriting standards. Loans endorsed during the 2005 to 2008 period are expected to suffer the most from the recent national housing recession. Also, the surviving mortgages originated between FY 2009 and FY 2012 will enter their peak default periods during FY 2013 through FY 2017. With over 78 percent of the entire Fund concentrated in mortgages originated from FY 2009 through FY 2012, the Fund is expected to realize high claim losses during FY 2013 through FY 2017.

The projected endorsement volume of the FY 2012 book remains high, making it the third largest book in FHA history, after the peak volumes endorsed in FY 2009 and FY 2010. These recent books since FY 2009 have the best credit quality compositions among FHA's endorsements since 1975. In addition, the FY 2012 book further has higher annual insurance premium rates. Meanwhile, as the housing market is forecasted to move slowly out of its worst period, the FY 2012 book of business is projected to generate a positive $11.92 billion of economic value to the Fund as shown in Exhibit II-1 (including the upfront insurance premiums).

Exhibit III-3: Endorsements and Insurance-in-Force as of End of FY 2012($ Millions)

Book of Business[a]	Mortgage Endorsements	Unamortized Insurance in Force[b]	Amortized Insurance in Force[b]
1983	26,797	704	44
1984	15,924	405	63
1985	24,058	497	131
1986	56,440	1,576	483
1987	61,022	2,153	746
1988	35,508	1,117	466
1989	38,635	1,024	487
1990	47,125	1,063	551
1991	44,065	1,007	564
1992	45,090	1,411	809
1993	73,796	2,487	1,467
1994	79,689	3,548	2,160
1995	41,527	1,499	1,012
1996	61,694	2,461	1,724
1997	65,466	2,643	1,927
1998	88,591	4,803	3,498
1999	110,063	7,497	5,537
2000	86,803	3,805	3,042
2001	119,890	7,039	5,719
2002	128,890	12,390	10,047
2003	150,584	33,504	27,255
2004	92,893	27,607	23,185
2005	57,711	25,069	21,783
2006	50,138	22,235	20,006
2007	57,667	26,049	24,036
2008	176,111	81,263	76,106
2009	329,827	218,688	206,459
2010	295,397	239,497	228,995
2011	214,158	185,558	179,838
2012[c]	211,737	207,668	205,189
Total[d]	2,887,295	1,126,267	1,053,329

[a] End of year insurance-in-force
[b] Based on June 30, 2012 data extract from HUD and the performance of outstanding loans projected by the econometric models for the fiscal year 2012
[c] Based on HUD's August 2012 projection.
[d] Numbers may not add up due to rounding error.

B. Projected Future Economic Values

The economic value of the Fund is projected over the FY 2012 to FY 2019 period based on: (a) our time-series regression model that projects FHA's mortgage volume, (b) FHA's forecast of future endorsement composition, (c) our stochastic economic forecasts that are centered on Moody's July 2012 economic forecasts, and (d) cash flow projections based on the loan status transition, loss severity rate and cash flow models. The initial and subsequent annual economic values of each individual future book of business are first projected, and then appropriately combined to estimate the total economic value of the Fund in each year of the forecast period.

The present values of future books discounted to the end of each corresponding future fiscal year (through FY 2019) are presented in Exhibit III-4. Note that these are all positive apart from the adjustable rate streamline refinance loans to be endorsed in 2013. Due to curtailed private mortgage lending activities, FHA has become a primary source of housing finance in the above 80 percent LTV market. As a result of lenders tightening their underwriting guidelines and lack of alternative credit enhancement channels, FHA projects that the credit quality of the FY 2013 and future mortgages will continue to be better than the historical average prior to the recent housing recession. At the same time, insurance premiums are higher than their historic levels. The high-claim-rate downpayment assistance loans have diminished since FY 2009 and are prohibited by HERA. All these changes have positive impacts on the expected present values of the future books.

Exhibit III-4: Present Value of Future Books of Business by Mortgage Type ($ Millions) [a]

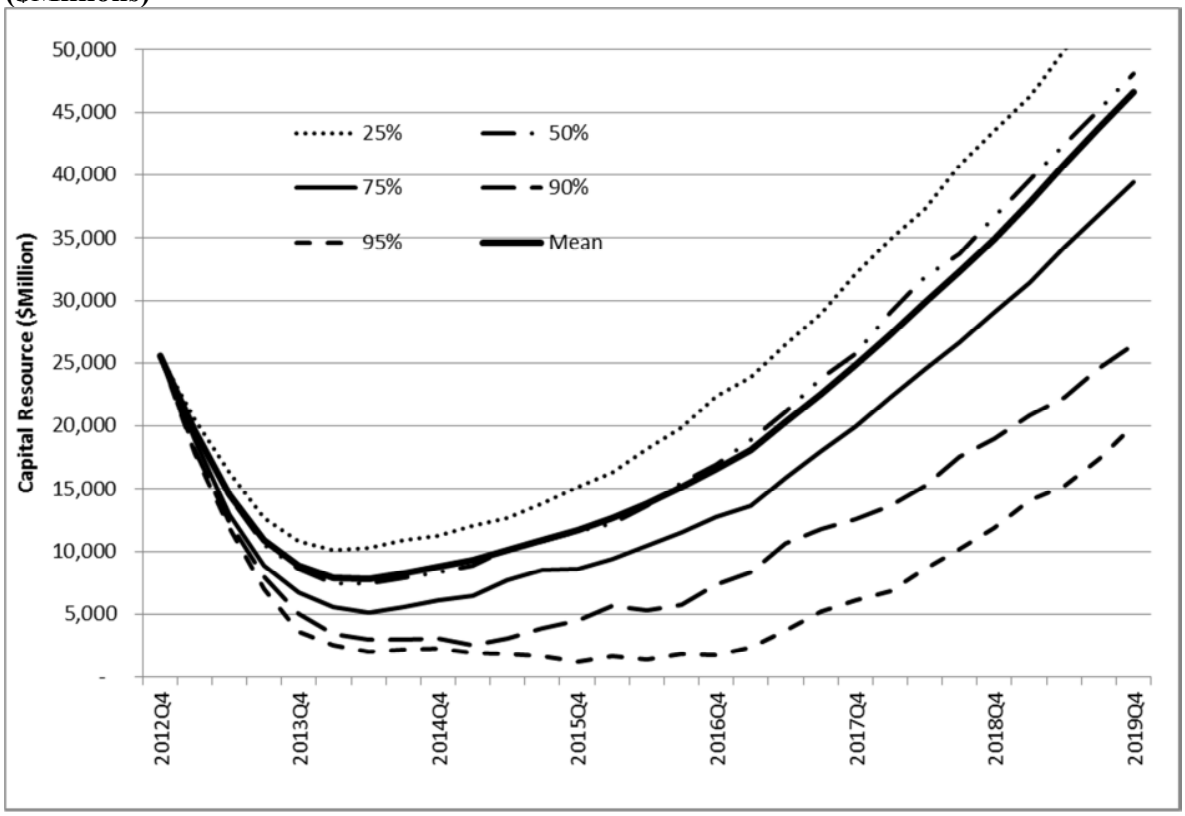
Fiscal Year	FRM 30	FRM 15	ARM	SR 30	SR 15	SR ARM	Total
2013	8,502	431	28	1,936	68	-55	10,911
2014	5,546	317	16	783	35	4	6,701
2015	5,911	340	26	599	27	37	6,939
2016	6,594	379	31	1,408	64	109	8,584
2017	6,444	368	27	1,786	79	100	8,804
2018	6,454	369	25	1,719	73	102	8,743
2019	6,080	354	22	1,754	76	111	8,396

[a] Present values are estimated as of the end of each respective fiscal year.

C. Projected Future Capital Resources

In this section we project potential alternative future capital resources based on our 100 Monte Carlo simulation paths. All the paths start from the $25.57 billion of capital resources at the end of FY 2012. Going forward, the capital resources were updated with investment returns and future insurance net cash flows, including upfront premiums, annual premiums, premium refunds, loss mitigation costs, and net claim losses. Exhibit III-5 displays the variations in the capital resources under a wide range of possible economic scenarios, derived according to selected percentiles of our 100-path Monte Carlo simulation. The future paths in Exhibit III-5 are plotted for the selected percentiles on a quarterly basis. The expected/mean capital resources would reach its lowest point of $7.83 billion in FY 2014 and slowly recover after that. The level is expected to return to that of FY 2012Q4 in FY 2018Q2. At the 95 percentile level, the capital resources drop very close to zero but do not reach negative region between 2015 and 2016, and they are projected to climb back to $20.02 billion in FY 2019Q4. As a result, we conclude that there is nearly a 95 percent chance that the forward portfolio of the MMI Fund will have positive capital resources each year over the next 7 years.

Exhibit III-5: Mean and Selected Percentile Projections of the Fund's Capital Resources ($Millions)



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Section IV: Characteristics of the Fiscal Year 2012 Insurance Portfolio

This section analyzes the characteristics of the loan portfolio insured by the Fund[31] at the end of FY 2012. This discussion covers the following three areas: (1) analysis of the volume and composition of loan types, (2) comparison of new purchase loans versus refinances, and (3) the distribution of loans by initial relative loan size, loan-to-value ratios, and borrower credit scores. This section also examines and compares the FY 2012 book with previous books in order to gain insights into how the FY 2012 book is likely to influence the future performance of the Fund. Because the data used for this analysis are an extract as of June 30, 2012, the characteristics for the FY 2012 book reflect only loans originated in the first three quarters of FY 2012 -- between October 1, 2011 and June 30, 2012. The year-end portfolio size was estimated by an endorsement volume model (details in Appendix F).

In the rest of this section, we examine FHA's business concentration profile to determine if there are indicators that could have significance for the FY 2012 Actuarial Review.

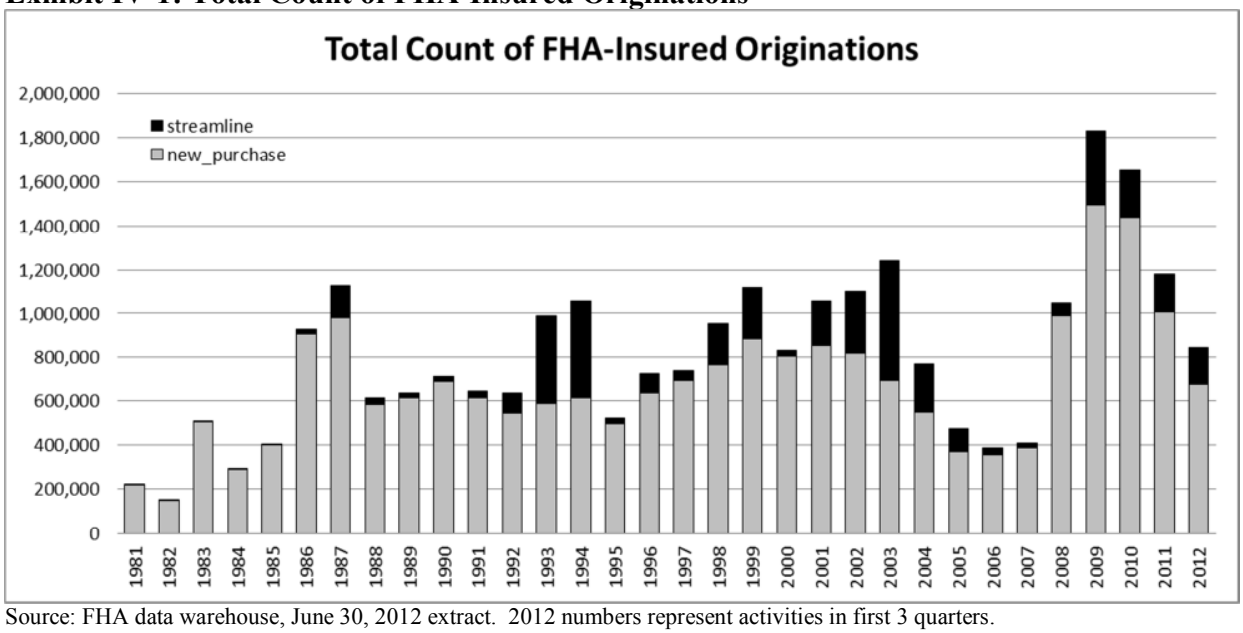
A. Volume and Share of Mortgage Originations

We project FHA to endorse $211.74 billion in single-family forward mortgages in FY 2012, bringing the Fund's total unamortized IIF to $1,126.27 billion. Exhibit IV-1 shows the annual FHA origination counts as of June 30, 2012 for fully underwritten purchase and refinance loans and for streamline refinancing loans, for FY 1981 through FY 2012.

Exhibit IV-1 shows that FHA's business by number of loans, which had dropped significantly from FY 2003 to FY 2006, has increased dramatically in the last four years. This phenomenon is reflected in the data by a clear reversal of the declining volume trend, starting in the second quarter of FY 2007. Most private mortgage insurance companies dramatically scaled back their insuring activities in the past few years, as they were constrained by their limited capital reserves. Consequently, the GSEs have been less able to purchase or guarantee loans with less than a 20 percent downpayment, and FHA has been the primary source of higher LTV mortgage loans during the past three years.

[31] The Fund in this Review refers to the MMI Fund excluding HECMs.

Exhibit IV-1: Total Count of FHA-Insured Originations



Source: FHA data warehouse, June 30, 2012 extract. 2012 numbers represent activities in first 3 quarters.

Exhibit IV-2 shows FHA's origination volume and market share in home purchase mortgages from FY 1995 through FY 2012. FHA's market share, which had averaged about 13 percent during the period from FY 1994 through FY 2002, declined to a low of 3.77 percent in FY 2006. This trend has reversed during the past several years and by FY 2008, FHA's market share was back to 1990's levels. FHA's share by loan count increased from 4.12 percent in FY 2007 to 19.13 percent in FY 2010, and its share by dollar volume increased from 1.75 percent in FY 2007 to 14.66 percent in FY 2010. The partial-year FY 2012 data shows that the FHA share by loan count was 15.78 percent and the share by dollar volume was 12.16 percent.

Exhibit IV-2: FHA's Market Share in the Home Purchase Mortgage Market

Fiscal Year	Number of Mortgages Originated (thousands)			Volume of Mortgages Originated (dollars in billions)		
	FHA[a]	Market[b]	FHA Share (%)	FHA	Market	FHA Share (%)
1995	556	4,845	11.48	45	689	6.46
1996	686	5,289	12.97	58	784	7.43
1997	751	5,467	13.74	66	854	7.73
1998	789	6,084	12.96	71	1,004	7.12
1999	909	6,463	14.06	89	1,124	7.96
2000	856	6,335	13.52	89	1,157	7.71
2001	869	6,405	13.57	96	1,221	7.87
2002	806	6,615	12.18	94	1,356	6.93
2003	655	7,148	9.16	80	1,578	5.09
2004	505	7,901	6.4	63	1,914	3.28
2005	345	8,454	4.08	43	2,247	1.89
2006	301	7,979	3.77	39	2,201	1.75
2007	288	6,992	4.12	39	1,920	2.04
2008	719	5,688	12.64	118	1,453	8.14
2009	994	5,315	18.70	171	1,196	14.27
2010	1,069	5,589	19.13	183	1,252	14.66
2011	766	5,236	14.63	130	1,148	11.35
2012[c]	479	3,016	15.78	80	655	12.16

Sources: FHA Share of Home Purchase Activity Report[32]. Existing Home Sales are from the National Association of Realtors; New Homes Sales are from the U.S. Census Bureau and include manufactured housing; FHA numbers are from HUD.

[a] Home purchase loans endorsed by FHA under either the General Insurance Fund or the MMI Fund.

[b] Total number of home sales in the nation.

[c] FY 2012 numbers are through May 2012.

B. Originations by Location

FHA insures loans in all regions of the U.S., but about half of FHA's total dollar volume is concentrated in only ten states. Exhibit IV-3 shows the percentage of FHA's total dollar volume originated in these ten states from FY 2008 through FY 2012. The states are ordered based on the dollar volume endorsed during FY 2012.

[32] http://portal.hud.gov/hudportal/HUD?src=/program_offices/housing/rmra/oe/rpts/fhamktsh/fhamkt

Exhibit IV-3: Percentage of Origination Volume by the Top-10 States

State Location[a]	2008	2009	2010	2011	2012
California	7.51	12.80	15.11	17.48	19.01
Texas	7.12	5.51	6.11	5.99	6.58
New York	3.38	3.54	4.13	4.58	4.37
Florida	4.92	3.87	4.22	4.27	4.15
New Jersey	3.89	4.28	4.08	4.12	3.91
Virginia	4.35	4.50	3.94	3.87	3.88
Pennsylvania	4.27	4.19	3.63	3.63	3.44
Maryland	3.28	3.47	3.73	3.55	3.39
Illinois	4.08	4.08	3.61	3.28	3.24
Colorado	3.20	3.23	3.11	3.06	2.94

Source: FHA data warehouse, June 30, 2012 extract.
[a] States are ranked according to their share of FY 2012 origination volume in the Fund.

The percentage share of FHA loans originated in California increased significantly from 7.51 percent in FY 2008 to 19.01 percent in FY 2012, likely due to the increase in the FHA loan size limits and the decrease in average house prices in most parts of California. Currently, loans in California comprise the largest percentage of all FHA loans in dollar volume.

Historical house prices in the local housing markets are captured by our econometric models through the variables measuring recent home price appreciation, current loan-to-value ratio, and the dispersion of house price growth rates within a location. The geographical concentration of the Fund and projected values of these variables in the various locations have been reflected in the actuarial simulation model.

C. Originations by Mortgage Type

Exhibit IV-4 shows that the fully underwritten 30-year fixed-rate mortgage (FRM) has generally comprised the majority of FHA's single-family business, representing an average share of approximately 75.6 percent of the business over the period 1983-2012. The share of total mortgages represented by 30-year FRMs began to change in the early 1990s when FHA started insuring the adjustable-rate mortgage (ARM) and the streamline-refinancing mortgage (SR). For the next few years, ARM and SR mortgages gradually assumed a bigger share of annual loan originations and the 30-year FRM share decreased, with FY 1993, FY 1994, and FY 2003 recording the lowest shares of 30-year FRMs. An opposite trend has emerged from FY 2003 through FY 2007, in which 30-year FRM endorsements increased from 51.42 percent to 92.14 percent, while 30-year SR endorsements dropped from 36.95 percent to 5.12 percent. However, the share of 30-year FRMs endorsed in FY 2009 through FY 2012 dropped to an average level of

73.79 percent. The corresponding average yearly share of 30-year SRs increased during the same four year period to 17.33 percent. The ARM share of the portfolio (including both ARMs and ARM SRs) also shrank dramatically from 11.52 percent in FY 2005 to 1.05 percent in FY 2009, and then rose to 6.03 percent in FY 2011, but declined to 2.86 percent in FY 2012. Since ARMs are more vulnerable to economic downturns, the smaller concentration of ARMs in the most recent books of business will likely help the performance of the Fund during the next few years. The 15-year FRMs have increased from 1.22 percent in FY 2007 to 7.47 percent in FY 2012. 15-year SRs continue to be a relatively minor product type in the total Fund portfolio.

The dynamics of the concentrations of product types are captured by our econometric models with separate models fitted to the historical performance of the six individual mortgage product types.

Exhibit IV-4: FHA-Insured Originations by Mortgage Type (Percentage of FHA-Insured Mortgages by Dollar Volume)

Fiscal Year	Fully Underwritten Mortgages			Streamline Refinancings		
	30-Year FRMs	15-Year FRMs	ARMs	30-Year SRs	15-Year SRs	ARMs SRs
1983	93.72	6.28	0.00	0.01	0.00	0.00
1984	94.28	5.68	0.01	0.02	0.01	0.00
1985	92.00	7.75	0.14	0.08	0.03	0.00
1986	88.93	8.07	0.74	1.90	0.36	0.00
1987	80.44	4.97	1.47	11.22	1.84	0.06
1988	86.30	3.59	4.98	4.64	0.45	0.04
1989	92.95	2.69	1.52	2.64	0.19	0.00
1990	93.09	2.77	0.80	3.09	0.25	0.00
1991	88.20	3.14	4.43	3.63	0.57	0.04
1992	66.79	2.51	16.35	10.84	2.17	1.34
1993	45.78	2.25	12.14	29.96	7.75	2.13
1994	42.49	1.81	16.97	27.95	8.06	2.72
1995	65.10	1.28	29.25	2.78	0.94	0.65
1996	61.09	1.29	25.42	8.65	1.72	1.83
1997	57.18	1.10	35.06	3.62	0.69	2.35
1998	65.56	1.16	11.93	17.78	1.39	2.18
1999	73.57	1.13	4.24	18.35	1.74	0.98
2000	85.36	0.71	11.04	2.06	0.26	0.57
2001	75.84	0.94	2.08	19.77	0.65	0.73
2002	66.96	1.21	6.05	21.11	1.57	3.09
2003	51.42	1.34	3.89	36.95	3.12	3.29
2004	63.62	1.36	8.70	19.53	2.43	4.36
2005	69.55	1.26	8.67	16.30	1.37	2.85
2006	88.66	1.35	2.65	6.66	0.48	0.21
2007	92.14	1.22	1.34	5.12	0.11	0.07
2008	90.78	1.59	1.54	5.80	0.14	0.15
2009	76.78	2.20	0.73	19.58	0.38	0.32
2010	78.70	3.63	2.85	13.43	0.36	1.03
2011	72.63	5.68	4.22	15.03	0.63	1.81
2012[a]	67.03	7.47	1.66	21.26	1.37	1.20

Source: FHA data warehouse, June 30, 2012 extract.
[a] Based on partial year data.

D. Initial Loan-to-Value Distributions

Based on previous econometric studies of mortgage behavior, a borrower's equity position in the mortgaged house is one of the most important drivers of default behavior. The larger the equity position a borrower has, the greater the incentive to avoid default on the loan. The original LTV is an inverse measure of the borrower's equity at origination. Exhibit IV-5 shows the distribution of mortgage originations by original LTV categories for the period from FY 1983 through FY 2012.

As Exhibit IV-5 indicates, the distribution among initial LTV categories shifted significantly after FY 1999. Over half of the loans insured during the period of FY 2000 to FY 2005 were concentrated in the category of LTVs greater than or equal to 97 percent. This concentration in the highest risk category gradually declined during the past four years. In 2008, HERA placed a limit of 96.5 percent on LTV, with no additional allowance for the financing of closing costs. During FY 2009, 20.5 percent of mortgages had LTV ratios of 97 percent or more. This is a 63 percent reduction from FY 2005, when over 55.52 percent of that book of business was concentrated in this highest LTV category. In FY 2010 to FY 2012, this concentration further dropped to only 4.49, 5.12 and 4.69 percent, respectively. Thus the relative percentage of mortgages in this highest risk category in FY 2012 was less than one tenth of the corresponding percentage in FY 2005.

The LTV concentration of individual books of business affects the econometric models in two ways. First, it serves as the starting position for updating the current LTV variable. Holding everything else constant, loans with higher original LTVs will experience a higher current LTV in future years. Second, the original LTV itself is also included in the models for fully underwritten products to capture potential behavioral differences among borrowers who self-select into different original LTV categories. For streamline refinance loans, we use the original LTV of the prior fully underwritten mortgage to the same borrower, updated for local HPA and amortization, as a proxy for this variable.

Exhibit IV-5: Distribution of Originations by Original LTV Category (Percentage of Fully Underwritten FHA-Insured Mortgages by Dollar Volume)

Books of Business	Unknown LTV	≤ 80%	> 80% ≤ 90%	> 90% ≤ 95%	> 95% < 97%	≥ 97%
1983	20.37	19.06	24.40	21.53	13.38	1.25
1984	2.77	16.20	26.17	26.32	21.52	7.03
1985	1.11	16.19	31.22	27.14	21.69	2.64
1986	0.56	18.26	30.33	27.35	20.51	3.00
1987	0.18	15.57	27.26	29.84	24.02	3.13
1988	0.13	8.01	19.72	35.57	31.87	4.71
1989	8.90	6.79	16.86	33.13	29.89	4.43
1990	11.90	6.15	16.20	32.21	29.13	4.40
1991	1.79	5.59	15.74	29.70	30.07	17.11
1992	1.76	4.39	13.99	28.03	38.26	13.57
1993	0.31	3.65	12.85	25.76	32.72	24.73
1994	0.24	3.46	11.70	24.43	32.77	27.40
1995	0.07	2.75	10.36	24.46	34.31	28.05
1996	0.03	2.84	11.10	25.50	34.72	25.81
1997	0.01	3.26	11.43	26.18	34.67	24.45
1998	0.01	3.55	12.23	26.46	34.85	22.91
1999	0.00	3.17	9.10	13.29	30.59	43.84
2000	0.00	2.34	6.23	6.81	32.54	52.07
2001	0.00	3.27	7.56	6.85	25.32	57.00
2002	0.00	3.88	8.09	6.84	24.23	56.96
2003	0.00	5.47	9.61	7.11	24.18	53.63
2004	0.01	5.56	9.17	7.23	23.66	54.38
2005	0.01	5.80	9.22	6.81	22.65	55.52
2006	0.01	6.81	10.06	13.88	19.91	49.34
2007	0.01	7.34	11.46	20.91	18.04	42.24
2008	0.01	6.17	12.05	24.04	13.41	44.31
2009	0.01	5.35	14.10	19.62	40.40	20.52
2010	0.01	5.01	14.97	11.44	64.09	4.49
2011	0.01	5.08	14.58	11.23	63.98	5.12
2012[a]	0.02	6.10	12.09	10.27	66.83	4.69

Source: FHA data warehouse, June 30, 2012 extract
[a] Based on partial year data.

E. Borrower Credit History Distributions

Credit score data were collected through two different channels. The first channel includes credit scores collected for a sample of FHA applications from FY 1992, FY 1994, and FY 1996, and subsequently extended to loan applications during FY 1997 through FY 2004. This set of credit score data is particularly useful because these loans have existed for many years and provide valuable historical delinquency, claim and prepayment performance information. The limitation of this data source is that it covers only a limited sample of FHA loans. In addition, the sample was originally collected for policy research purposes and represents a choice-based sample. For example, there was over-sampling of early-default loans among applications from the FY 1997 to 2004 period.

Since May 2004, all lenders originating loans for FHA insurance have been required to report borrower credit scores directly to HUD if any credit scores were ordered as part of the underwriting process. All loans going through the FHA TOTAL scorecard have credit scores obtained electronically by the affiliated automated underwriting systems (AUSs). This is the second source of credit score data. As there are no exceptions to this requirement, the credit scores collected through this channel are considered to be comprehensive and unbiased. These loans have grown to be the dominant source of credit score information for our analysis.

Exhibit IV-6 shows the distributions of fully underwritten FHA mortgage loans by borrower credit score categories and origination years. The distribution among credit score categories remained stable during the FY 2005 through FY 2008 books. For loans originated after FY 2008, the credit score distribution showed significant improvement over the previous years. Approximately 57.5 percent of the FY 2012 loans have credit scores above 680. Loans with credit scores below 600 are only 0.8 percent of the loans originated in FY 2012, which is a substantial decline from the FY 2008 book, where 21.9 percent of the loans had credit scores below 600.

In the econometric models, we also controlled for missing and uncollected credit scores. In Exhibit IV-6, the category "Missing" refers to loans with insufficient borrower credit history to generate a credit score and the category "Not Collected" refers to loans where no attempt was made to obtain the credit score for some of the FY 2004 and earlier loans.

Exhibit IV-6: Distribution of Originations by Credit Score (Percentage of Fully Underwritten FHA-Insured Mortgages by Dollar Volume)

Books of Business	Missing	300-499	500-559	560-599	600-639	640-679	680-850	Not Collected
1996[a]	3.92	0.03	0.71	1.89	3.81	4.50	8.23	76.91
1997[a]	2.37	0.19	1.39	2.56	4.17	3.98	5.60	79.73
1998[a]	1.81	0.24	1.84	3.19	5.23	4.70	5.52	77.47
1999[a]	1.71	0.22	1.83	3.32	5.40	4.67	4.99	77.86
2000[a]	1.89	0.33	2.44	3.47	5.00	4.01	4.01	78.85
2001[a]	1.37	0.27	2.14	3.31	4.64	3.78	3.92	80.58
2002[a]	1.33	0.31	2.33	3.58	5.09	4.22	4.57	78.58
2003[a]	1.45	0.32	2.69	4.29	6.18	5.18	5.63	74.27
2004[c]	3.04	0.51	4.93	8.64	12.58	10.43	11.71	48.15
2005[b]	4.99	0.93	9.33	16.96	24.56	20.25	22.98	
2006[b]	4.66	0.92	8.69	16.55	24.38	20.69	24.10	
2007[b]	4.42	1.43	11.65	19.43	24.82	18.82	19.42	
2008[b]	2.17	0.81	7.13	14.78	24.67	22.43	28.02	
2009[b]	0.77	0.05	1.20	5.61	19.38	25.38	47.61	
2010[b]	0.68	0.01	0.19	1.05	14.36	26.68	57.03	
2011[b]	0.46	0.00	0.08	0.59	10.03	29.13	59.70	
2012[b]	0.31	0.00	0.12	0.63	9.82	31.66	57.46	

[a] Credit score data are obtained from the previous HUD special data collection project. Problematic loans were over-sampled during the years 1997 to part of 2004.
[b] Starting May 2004, lenders were required to report credit score data directly to HUD.
[c] Mixture of the above two sources of data.

F. Initial Relative Loan Size Distributions

The relative house price variable is computed by comparing the mortgage origination amount with the average loan size of all other FHA-insured loans originated within the same period and in the same state. This replaces the relative house price variable used in last year's Review. Empirical results show this variable is very significant in prepayment-related termination.

FHA experience indicates that larger loans tend to perform better compared with smaller loans in the same geographical area, all else being equal. Larger loans incur claims at a lower rate and in those cases where a claim occurs, loss severity tends to be lower. Prior to the increase in FHA's loan limits in FY 2008, houses securing larger FHA loans tend to fall into the average house

price range for their surrounding areas. Since this market is relatively liquid and there are a relatively large number of these similar-quality homes in the area, the house price volatility of these houses tends to be relatively smaller in comparison to the house price volatility of extremely low- and high-priced houses. With the high FHA loan size limit in the past few years, some of the largest FHA loans moved into the high-priced housing market. However, that remains a small percentage of FHA's share.

Exhibit IV-7 shows the percentage of new fully underwritten mortgage originations within each relative loan size category. The distribution has been reasonably stable over time with the largest share in the 75-to-125 percent of area average loan size categories. However, since FY 2000, there has been a trend of a steady increase in the relative proportion in the highest loan size category. The proportion in the highest loan size category increased from 9.65 percent in FY 2008 to 13.31 percent in FY 2012. On the other hand, the share in lowest loan size category also increased from 6.86 percent in FY 2008 to 10.29 percent in FY 2012. The increase in both the highest and lowest loan size categories demonstrate the penetration of FHA products into the high loan balance loans, due to the higher loan limit, and the regaining of the low loan balance loans, which were generally originated as non-FHA subprime loans during the housing bubble.

Exhibit IV-7: Distribution of Originations by Relative Loan Size (Percentage of Fully Underwritten FHA-Insured Mortgages by Dollar Volume)

Books of Business	0-50% of Average Loan Size	50-75% of Average Loan Size	75-100% of Average Loan Size	100-125% of Average Loan Size	125-150% of Average Loan Size	>150% of Average Loan Size
1982	5.44	16.68	28.07	29.10	15.50	5.21
1983	3.98	16.23	29.41	31.23	15.39	3.75
1984	4.22	16.80	29.25	30.27	15.01	4.45
1985	4.22	16.56	28.96	30.38	16.05	3.83
1986	3.17	15.57	30.41	33.71	14.58	2.58
1987	2.86	15.99	30.66	33.27	14.80	2.43
1988	3.71	17.36	29.15	29.75	15.44	4.59
1989	4.20	17.76	28.88	28.00	15.63	5.54
1990	4.38	18.40	28.77	26.93	15.31	6.21
1991	4.52	18.23	28.80	26.42	15.79	6.25
1992	4.05	17.49	29.45	27.93	15.76	5.32
1993	3.31	16.62	30.94	29.62	15.25	4.25
1994	3.78	17.60	30.25	27.83	15.10	5.45
1995	4.22	18.56	28.59	27.14	15.98	5.52
1996	4.11	18.00	28.81	27.97	16.30	4.81
1997	4.16	18.03	28.43	28.37	16.13	4.89
1998	3.84	17.28	28.93	29.98	15.73	4.24
1999	4.17	18.09	29.34	28.13	14.52	5.75
2000	5.01	18.78	28.42	25.98	14.83	6.98
2001	4.66	17.80	29.57	27.04	14.56	6.38
2002	4.98	17.73	29.37	26.88	14.37	6.68
2003	4.91	17.56	29.37	27.44	14.25	6.46
2004	6.05	18.76	27.48	25.32	14.71	7.67
2005	6.34	18.97	26.96	25.01	14.81	7.90
2006	6.22	19.72	26.57	24.82	14.46	8.22
2007	6.17	19.90	26.49	24.66	14.26	8.51
2008	6.86	20.28	27.64	22.98	12.61	9.65
2009	8.41	21.02	26.68	20.46	11.80	11.63
2010	9.45	21.98	25.72	19.12	11.00	12.74
2011	10.64	22.18	24.50	18.27	10.81	13.60
2012 [a]	10.29	22.08	24.66	18.63	11.02	13.31

Source: FHA data warehouse, June 30, 2011 extract

[a] Based on partial year data.

G. Initial Contract Interest Rate

Exhibit IV-8 shows the average mortgage contract rate by mortgage type since FY 1994. Average contract rates in FY 2012 are the lowest of this entire time period.

In general, an FRM with a lower initial contract rate tends to prepay at a slower speed. As interest rates are projected to rise eventually after the next two years, the prepayment rates of the FY 2011 and FY 2012 originations are likely to remain low. As these loans will have longer durations, more insurance premium income will be generated, thus tending to improve the economic value of these recent books. However, with a larger outstanding book, the increased income will be at least partially offset by higher cumulative claim losses.

Exhibit IV-8: Average Contract Interest Rate by Loan Type Percent

Fiscal Year	30-Year FRMs	15-Year FRMs	ARMs	30-Year SRs	15-Year SRs	ARM SRs	Book of Business
1994	7.56	7.12	6.06	7.76	7.43	6.09	7.36
1995	8.39	8.23	7.18	8.70	8.74	7.34	8.10
1996	7.84	7.53	6.49	8.01	7.69	6.79	7.53
1997	7.97	7.75	6.53	8.29	8.04	6.81	7.51
1998	7.37	7.18	6.12	7.58	7.18	6.48	7.25
1999	7.24	6.95	6.00	7.17	6.89	6.05	7.16
2000	8.30	8.07	6.95	8.31	8.05	6.19	8.16
2001	7.56	7.12	6.19	7.42	6.85	6.12	7.49
2002	7.00	6.53	5.28	6.95	6.42	5.31	6.84
2003	6.07	5.50	4.38	6.01	5.49	4.44	5.91
2004	6.12	5.57	4.46	5.98	5.52	4.39	5.88
2005	5.92	5.63	4.79	5.85	5.65	4.67	5.79
2006	6.33	6.18	5.42	6.14	6.04	5.13	6.28
2007	6.51	6.40	5.62	6.38	6.25	5.59	6.49
2008	6.33	5.95	5.40	6.08	5.63	5.33	6.29
2009	5.60	5.11	4.94	5.26	4.80	4.52	5.51
2010	5.13	4.62	3.97	5.12	4.65	4.26	5.07
2011	4.65	4.16	3.51	4.62	4.16	3.68	4.56
2012[a]	4.06	3.50	3.17	4.08	3.54	3.39	4.00

Source: FHA data warehouse, June 30, 2012 extract.
[a] Based on partial year data.

H. Source of Downpayment Assistance

Exhibit IV-9 reports the distribution of annual loan endorsements by source of downpayment assistance since FY 2001. Secondary loans provided by local governments were included in the category of downpayment assistance by government in this year's Review. Starting in FY 2001, there was a rapid increase in the share of loans with gift letters from non-profit, religious, or community institutions. This concentration increased dramatically to almost 25 percent in the FY 2005 to FY 2007 books of business. Following the passage of HERA, which effectively terminated seller-financed downpayment assistance effective October 1, 2008, the share of loans with this type of assistance declined to negligible amounts after FY 2008.

Exhibit IV-9: Distribution of Downpayment Assistance Loans by Source (Percent)[a]

Origination Fiscal Year	No Gift	Relative	Non-profit, Religious, or Community	Government	Employer
2001	83.23	11.08	4.25	1.36	0.07
2002	82.26	9.15	7.05	1.48	0.06
2003	81.35	7.41	9.76	1.42	0.06
2004	70.24	9.59	18.05	2.04	0.08
2005	63.87	9.50	23.52	3.03	0.08
2006	62.03	9.39	24.30	4.18	0.10
2007	65.58	7.80	23.14	3.40	0.08
2008	72.21	7.12	18.91	1.71	0.06
2009	85.27	11.55	2.52	0.59	0.07
2010	82.05	16.95	0.12	0.79	0.08
2011	83.49	15.17	0.17	1.10	0.07
2012[b]	83.80	14.90	0.19	1.04	0.06

Source: FHA data warehouse, June 30, 2012 extract.
[a] As a percentage of all Fund endorsed loans, including purchase and refinance loans. The rate of downpayment assistance would be much higher if refinance loans were excluded from this calculation.
[b] Based on partial year data.

Exhibit IV-10 shows the cumulative claim rates realized since FY 2001 on loans by downpayment gift source and origination year. Loans with any form of downpayment assistance performed worse across all origination years than loans receiving no downpayment assistance. In order to reflect this differential performance of loans with alternative downpayment assistance sources, our econometric models incorporated a series of categorical variables to reflect this important characteristic. The estimated coefficients of these downpayment assistance-source variables are both economically and statistically significant.

Exhibit IV-10: Cumulative-to-Date Claim Rates by Down payment Assistance Source Percent

Origination Fiscal Year	No Gift	Relative	Non-profit, Religious, or Community	Government	Employer
2002	5.48	6.50	16.86	14.29	7.76
2003	5.21	7.10	18.04	14.92	10.62
2004	6.56	7.98	19.00	13.10	10.31
2005	8.84	10.22	20.77	15.32	13.03
2006	10.66	11.75	20.98	14.18	18.68
2007	10.56	10.92	19.21	14.05	12.62
2008	7.06	6.04	11.46	9.33	6.32

Source: FHA data warehouse, June 30, 2012 extract.

Among the different downpayment assistance sources, loans with gifts from non-profit organizations have the highest cumulative claim rates for all origination years. GAO reported[33] that the downpayment assistance loans had been misused by many non-profit organizations, with the assistance being funded by home sellers. The high concentration of the FY 2004 to FY 2008 books in loans with downpayment assistance from non-profit organizations makes the claim risk of these books of business particularly high.

These loans have contributed significant negative economic value to the Fund in recent years, as shown by Exhibit IV-11, which reports the present value of the cash flows of these loans since their origination by downpayment assistance sources. While loans funded with assistance from non-profit organizations accounted for about 18.56 percent of the origination volume of FY 2001 through FY 2008 downpayment-assisted loans, they generated 41.06 percent of the negative present value of the cash flows from these books of business.

[33] "Mortgage Finance Additional Action Needed to Manage Risks of FHA-Insured Loans with Downpayment Assistance," Government Accountability Office, November 2005.

Exhibit IV-11: Present Value of Cash Flows since Endorsement, by Down payment Assistance Source as of the End of FY 2012($ Millions)[a]

Origination Year	No Gift	Relative	Non-Profit, Religious, or Community	Government	Employer	Total
2001	-497	-373	-228	-119	0	-1217
2002	-116	-154	-868	-88	0	-1227
2003	-1107	-281	-1540	-273	0	-3200
2004	-2070	-317	-2078	-162	0	-4627
2005	-1626	-393	-1909	-247	0	-4175
2006	-2840	-575	-1770	-808	0	-5994
2007	-5020	-527	-2155	-548	0	-8249
2008	-11958	-626	-4706	-771	0	-18060
Total	-25235	-3246	-15253	-3017	0	-46750

[a] Numbers may not add up due to rounding error.

These costly non-profit down payment assistance loans have a significant negative impact on the financial state of the Fund. Exhibit IV-11 shows that, since their initial endorsement through the eventual termination, these loans contribute *negative* $15.25 billion to the economic value of the MMI Fund as of the end of FY 2012. We also estimated that these loans accounted for $39.08 billion of the amortized IIF as of the end of FY 2012. Therefore, if these loans had been excluded from the Fund, the revised economic value and the amortized IIF of the Fund would have been *positive* $1.77 billion and $1,014.249 billion, respectively. On the positive side, following the elimination of this type of high-risk loan by HERA in 2008, the performance of recent and future books of business are improved over what would have been the case if these loans had still been underwritten in significant amounts.

Section V: Fund Performance under Alternative Scenarios

The realized economic value of the Fund will vary from the Review's estimate if the actual drivers of loan performance deviate from the base case projections. In this section, we present the base case economic value from the Monte Carlo simulation and seven alternative scenarios. The base case of the Review is the mean of the economic value of the Fund among the 100 simulated paths. Each alternative scenario estimates the performance of the Fund under the specific future interest rate and house price appreciation rates under the specific path with no uncertainty.

The first five alternative economic scenarios were based on our 100 simulated paths, corresponding to the paths that yield the 10th best, 25th best, 25th worst, 10th worst and the worst projected economic values. The sixth path is the most stressful scenario among Moody's Analytics alternative forecasts published in July 2012. The last scenario assumes the current low interest rate environment will extend for two more years. The seven alternative scenarios are[34]:

- 10th Best Path in Simulation, the path that resulted in the 10th highest economic value in the Monte Carlo simulation.
- 25th Best Path in Simulation, the path that resulted in the 25th highest economic value in the Monte Carlo simulation.
- 25th Worst Path in Simulation, the path that resulted in the 25th lowest economic value in the Monte Carlo simulation.
- 10th Worst Path in Simulation, the path that resulted in the 10th lowest economic value in the Monte Carlo simulation.
- The Worst Path in Simulation, the path that resulted in the lowest economic value in the Monte Carlo simulation.
- Moody's Protracted Slump Scenario, the most stressful alternative scenario forecasted by Moody's Analytics in July 2012.
- Low Interest Rate Scenario, representing a continuation of the historically very low interest rate environment prevailing at the end of FY 2012.

The values of the projected house price indices and interest rates for all scenarios are described in Appendix D.

[34] Detailed description of these alternative scenarios is presented in Appendix B.

Exhibit V-1 reproduces the baseline projected Fund performance under the average of our Monte Carlo simulation paths as shown in Exhibit II-1. The estimated economic value of the Fund as of the end of FY 2012 is *negative* $13.48 billion, and the projected economic value for FY 2019 is positive $54.25 billion. These projections constitute the baseline, against which the projections from the alternative scenarios are to be compared. The economic values and IIFs of the Fund for FY 2012 through FY 2019 under the seven alternative scenarios are presented in Exhibits V-2 to V-8. While the baseline projection is based on a stochastic Monte Carlo simulation, each of the alternative scenarios is simulated with just the single specified path of HPI and interest rates. We discuss the results of these alternative simulations in order.

Exhibit V-1: Projected Baseline Fund Performance ($ Millions)

Fiscal Year	Economic Value of the Fund	Unamortized Insurance in Force	Amortized Insurance in Force	Economic Value of Each New Book of Business	Volume of New Endorse-ments	Investment Earnings on Fund Balances
2012	-13,478	1,126,267	1,053,329	11,922	211,737	
2013	-2,585	1,223,784	1,136,509	10,987	219,605	-95
2014	4,223	1,291,771	1,186,208	6,845	167,031	-37
2015	11,525	1,317,205	1,194,820	7,222	176,024	80
2016	20,984	1,353,817	1,217,462	9,163	221,233	296
2017	31,352	1,399,213	1,248,114	9,698	231,621	670
2018	42,502	1,436,476	1,269,906	9,988	235,533	1,162
2019	54,251	1,458,771	1,277,260	9,989	242,660	1,760

A. Selected Scenarios from Monte Carlo Simulation

The Monte Carlo simulation approach provided additional information about the probability distribution of the economic value of HECM with respect to different possible future economic condition and the corresponding prepayments and claims. In addition to the estimation of the "expected" economic value of HECM, the simulation also provided the economic value associated with each one of the 100 possible future economic paths. In other words, the simulation is composed of 100 different scenario analyses. The distribution among these scenarios allowed us to gain more insight into the volatility of the Fund with respect to the strength of future economic.

Exhibits V-2 to V-6 reported the projection of the economic value of the Fund under five alternative future economic conditions from the 100 simulated paths. Exhibit V-2 presents the 10th best result for FY 2012 economic value. This scenario results in the highest economic value among all alternative paths presented in this section from FY 2012 to FY 2019. Under this path, the economic value of the Fund is $2.83 billion at the end of FY 2012. This is $16.31 billion better than that of the mean across the 100 paths. The high economic value in this alternative path is resulted from a rapid house price appreciation rate prior to FY 2016 and a stable and moderate house price appreciation rate after FY 2016. This creates low claim losses. There is approximately 10 percent chance the economic condition can be even more favorable and yield higher economic value than $2.83 billion.

Exhibit V-2: Fund Performance: 10th Best Simulation Path ($ Millions)

Fiscal Year	Economic Value of the Fund	Unamortized Insurance in Force	Amortized Insurance in Force	Economic Value of Each New Book of Business	Volume of New Endorse-ments	Investment Earnings on Fund Balances
2012	2,827	1,173,969	1,101,425	13,840	211,006	
2013	18,987	1,245,034	1,159,478	16,140	227,241	20
2014	30,803	1,329,586	1,226,176	11,545	190,163	272
2015	38,095	1,424,671	1,299,607	6,708	162,981	583
2016	45,974	1,498,895	1,352,107	6,901	145,914	978
2017	54,281	1,558,844	1,390,391	6,839	154,190	1,469
2018	62,898	1,629,911	1,437,646	6,604	147,694	2,013
2019	71,711	1,649,091	1,432,105	6,209	145,660	2,604

Exhibit V-3 demonstrates that under the 25th best simulation path, the economic value of the fund at the end of FY 2012 would be *negative* $6.13 billion, which is $7.34 billion better than the baseline. The FY 2019 economic value would be $52.64 billion, which is $1.62 billion worse than the stochastic baseline. This is resulted from a below baseline house price appreciation, but rapid rising interest rate scenario, which keeps prepayments low and improves the annual premium. This illustrates the asymmetric feature of the impacts of a single stochastic path might have on different fiscal years' endorsement cohorts.

Exhibit V-3: Fund Performance: 25th Best Simulation Path ($ Millions)

Fiscal Year	Economic Value of the Fund	Unamortized Insurance in Force	Amortized Insurance in Force	Economic Value of Each New Book of Business	Volume of New Endorse-ments	Investment Earnings on Fund Balances
2012	-6,126	1,192,984	1,119,551	13,607	214,866	
2013	2,849	1,288,769	1,199,277	9,018	213,013	-43
2014	8,273	1,346,267	1,237,018	5,384	139,402	41
2015	14,641	1,410,261	1,281,410	6,211	176,489	157
2016	20,147	1,481,357	1,331,795	5,130	161,280	376
2017	26,798	1,487,193	1,321,332	6,007	158,601	644
2018	38,815	1,525,567	1,347,767	11,024	281,997	994
2019	52,636	1,460,496	1,271,590	12,213	288,020	1,607

Exhibit V-4 shows that the FY2012 economic value under 25th worst simulation path would be *negative* $19.50 billion, while the FY 2019 economic value would be $38.35 billion, which are $6.02 billion and $15.9 billion below the stochastic baseline, respectively. This path is characterized by house price deprecation in the short term and low appreciation in the intermediate term till FY 2019. After FY 2019, it has above-baseline house price appreciation. As a result, this path has a negative impact on the current book and cohorts originated between FY 2013 and FY 2019.

Combining exhibits V-3 and V4, the fund's FY 2012 economic value has an approximate 50% probability to be in the range of *negative* $19.50 billion to *negative* $6.13 billion.

Exhibit V-4: Fund Performance: 25th Worst Simulation Path ($ Millions)

Fiscal Year	Economic Value of the Fund	Unamortized Insurance in Force	Amortized Insurance in Force	Economic Value of Each New Book of Business	Volume of New Endorse-ments	Investment Earnings on Fund Balances
2012	-19,497	1,176,022	1,104,111	11,330	210,564	
2013	-10,427	1,269,171	1,181,258	9,207	207,008	-137
2014	-5,563	1,324,830	1,218,269	5,013	140,661	-149
2015	829	1,352,520	1,228,909	6,497	157,407	-105
2016	8,715	1,413,030	1,273,238	7,865	205,893	21
2017	15,403	1,432,795	1,277,461	6,409	179,539	278
2018	24,599	1,396,466	1,232,554	8,625	224,274	571
2019	38,351	1,296,283	1,129,172	12,734	305,675	1,018

Exhibit V-5 shows the 10th worst result of FY 2012 economic value among the 100 simulated paths. Under this path, house price had mild appreciation prior to FY 2015, then it experience three years of virtually zero house price growth. The house price finally picked up after FY 2018, which does not help the current book very much. Under this more pessimistic path, the economic value of the Fund is *negative* $25.08 billion at the end of FY 2012, which is *negative* $11.61 billion worse than the baseline expected economic value. There is approximately 10 percent probability that the actual realized economic can be even more stressful than this path, and result in even lower economic value. Combining the 10th best path and the 10th worse path, the Monte Carlo simulation results indicate that there is an 80 percent chance that the economic value of the Fund would be between *negative* $25.08 billion and $2.83 billion.

Exhibit V-5: Fund Performance: 10th Worst Simulation Path ($ Millions)

Fiscal Year	Economic Value of the Fund	Unamortized Insurance in Force	Amortized Insurance in Force	Economic Value of Each New Book of Business	Volume of New Endorse-ments	Investment Earnings on Fund Balances
2012	-25,083	1,193,346	1,119,331	11,124	214,313	
2013	-16,617	1,276,653	1,186,790	8,642	202,775	-176
2014	-11,576	1,340,649	1,232,074	5,279	154,402	-238
2015	-4,537	1,390,925	1,263,742	7,258	160,471	-219
2016	2,318	1,454,052	1,307,722	6,971	168,280	-116
2017	7,249	1,493,517	1,326,435	4,858	122,942	74
2018	14,235	1,491,624	1,309,615	6,717	156,140	269
2019	25,105	1,487,390	1,291,920	10,281	274,987	589

Exhibit V-6 shows the worst result from our Monte Carlo simulation. Under this scenario, the economic value of the Fund can be *negative* $65.31 billion. This is an extremely depressed scenario, where home price drops another 15% from its current level and do not recover to the current level until FY 2023. This is an extremely rare event, which implies another major housing recession. If such an event occurs, it would likely be a national or even global economic disaster.

Exhibit V-6: Fund Performance: Worst Simulation Path ($ Millions)

Fiscal Year	Economic Value of the Fund	Unamortized Insurance in Force	Amortized Insurance in Force	Economic Value of Each New Book of Business	Volume of New Endorse-ments	Investment Earnings on Fund Balances
2012	-65,305	1,180,089	1,107,629	8,019	211,946	
2013	-59,585	1,265,940	1,178,725	6,179	219,161	-458
2014	-57,502	1,338,390	1,230,945	2,935	149,893	-852
2015	-55,436	1,384,935	1,255,137	3,153	110,798	-1,088
2016	-53,889	1,420,793	1,270,296	2,971	117,098	-1,423
2017	-53,456	1,463,034	1,288,604	2,154	89,997	-1,722
2018	-52,247	1,495,088	1,297,182	3,191	87,650	-1,982
2019	-49,675	1,525,229	1,302,075	4,735	137,734	-2,163

B. Other Alternative Scenarios

Exhibit V-7 present the estimated economic value of the Fund based on Moody's "protracted slump" economic scenario. This scenario provides reasonableness check of the range of results obtained from the Monte Carlo simulation. Under the protracted slump scenario, Moody's mentions that "*House prices, as measured by the NAR median existing sales price, ultimately fall 39% cumulatively from the 2006 peak to the second quarter of 2014. The cumulative decline during the second dip from mid-2012 through mid-2014 is 22%.*"

Under Moody's protracted slump scenario, the levels of the house price indices converge to similar long-term index level of its baseline forecast. As a result, this scenario shows low house price growth rate in the short-term, followed by higher growth after cyclical bottoms. We applied a similar adjustment to this methodology as we did last year, where the growth rates converge to long-run growth rates instead of the indices converging to their long-term levels. This adjustment avoids having the stress scenarios show rosy growth after the initial stress period. As a result, the protracted slump scenario analyzed in this Review is more stressful than the original Moody's forecast. Appendix D provides more details about this adjustment.

Exhibit V-7 shows that FY 2012 economic value would be *negative* $65.41 billion under this most pessimistic scenario published by Moody's, which is $51.83 billion lower than the stochastic baseline. This is similar to that of the worst path in the Monte Carlo simulation. Thus, the modified Moody's protracted slump scenario is equivalent to a 99.5 percent level stress test. Under this scenario, the FY 2019 economic value would be *negative* $12.00 billion which is $42.25 billion lower than the stochastic baseline.

Exhibit V–7: Fund Performance: Protracted Slump ($ Millions)

Fiscal Year	Economic Value of the Fund	Unamortized Insurance in Force	Amortized Insurance in Force	Economic Value of Each New Book of Business	Volume of New Endorse-ments	Investment Earnings on Fund Balances
2012	-65,409	1,126,251	1,053,042	8,666	212,218	
2013	-54,295	1,080,097	1,000,153	11,574	212,893	-459
2014	-42,681	1,192,308	1,098,127	12,390	262,299	-776
2015	-34,603	1,279,572	1,166,272	8,886	190,663	-808
2016	-28,914	1,334,086	1,201,161	6,577	150,385	-888
2017	-23,948	1,371,427	1,218,535	5,890	137,939	-924
2018	-18,331	1,410,283	1,237,313	6,505	152,982	-888
2019	-12,000	1,448,995	1,255,667	7,089	170,076	-759

In a press release during August of 2011, the Federal Reserve Board announced its intention to keep the federal funds rate low for the next two years. On September 13, 2012 the Federal Reserve Board announced that *"……the Committee also decided today to keep the target range for the federal funds rate at 0 to 1/4 percent and currently anticipates that exceptionally low levels for the federal funds rate are likely to be warranted at least through mid-2015.*" Based on this new position, interest rates are likely to remain at their currently very low levels for an extended time. Hence, for the third scenario we coupled the baseline home price scenario with an interest rate path that remains at the current very low level for another two years. Rates then gradually rise toward the long-term stable levels of Moody's baseline scenario. This low-interest-rates scenario is constructed to understand better the impact of the performance of the Fund with respect to a persistence of unusually low rates.

Exhibit V-8 indicates that under this scenario the economic value of the FY 2012 Fund would be lower than the baseline by $17.58 billion, at *negative* $31.06 billion. This is similar to the 5th worst path in the simulation, which indicates a 5 percent chance the economic value can be lower than that of this low interest rate scenario.

Given low interest rates, most borrowers who can refinance would have done so, leading to lower premium income. The remaining seasoned portfolio would have a higher concentration of borrowers who were unable to refinance, probably due to inadequate housing equity or a poor credit score. Further, for borrowers with difficulties to refinance, the existing mortgage becomes a premium mortgage and the effective loan to value ratio increases, which induces higher default rates. On the other hand, this low-interest-rate scenario eliminates the sharp mortgage rate rise in FY 2013 in Moody's forecast. With lower starting interest rates, the FY 2013-2016 books would experience slower prepayment rates, bringing in more annual insurance premiums. The result is an FY 2019 economic value that is $12.96 billion lower than the baseline.

Exhibit V-8: Fund Performance: Low Interest Rates ($ Millions)

Fiscal Year	Economic Value of the Fund	Unamortized Insurance in Force	Amortized Insurance in Force	Economic Value of Each New Book of Business	Volume of New Endorse-ments	Investment Earnings on Fund Balances
2012	-31,058	1,125,852	1,052,924	9,339	212,218	
2013	-19,332	1,176,701	1,092,676	11,944	234,628	-218
2014	-5,272	1,196,628	1,101,656	14,336	243,540	-276
2015	8,717	1,310,957	1,199,536	14,089	256,535	-100
2016	16,969	1,381,562	1,251,017	8,028	178,157	224
2017	24,002	1,423,732	1,273,097	6,491	153,869	542
2018	32,131	1,461,759	1,291,333	7,239	171,250	890
2019	41,291	1,498,917	1,308,778	7,830	187,628	1,330

C. Summary

Exhibit V-9 shows the Fund's projected economic values from the baseline Monte Carlo simulation and those of the seven alternative single-path scenarios: the 10th best path in simulation, the 25th best path in simulation, the 25th worst path in the simulation, the 10th worst path in simulation, the worst path in simulation, Moody's protracted slump, and the low interest rate scenarios.

In all, except the 10th best path, scenarios, the economic value of the Fund is negative in FY 2012. Under the 25th best path scenario, the economic value recovers to positive in FY 2013. For the base case, it becomes positive in FY 2014. In FY2015, the estimated economic value also becomes positive for the 25th worst path scenario and the low interest rates scenario. In the Protracted Slump and the worst path in simulation, the projected economic value would remain negative through FY 2019.

Exhibit V-9: Projected Fund Economic Values by Alternative Scenarios ($ Millions)

Fiscal Year	Baseline Monte Carlo	10th Best Path	25th Best Path	25th Worst Path	10th Worst Path	Worst Path	Protracted Slump	Low Interest Rates
2012	-13,478	2,827	-6,126	-19,497	-25,083	-65,305	-65,409	-31,058
2013	-2,585	18,987	2,849	-10,427	-16,617	-59,585	-54,295	-19,332
2014	4,223	30,803	8,273	-5,563	-11,576	-57,502	-42,681	-5,272
2015	11,525	38,095	14,641	829	-4,537	-55,436	-34,603	8,717
2016	20,984	45,974	20,147	8,715	2,318	-53,889	-28,914	16,969
2017	31,352	54,281	26,798	15,403	7,249	-53,456	-23,948	24,002
2018	42,502	62,898	38,815	24,599	14,235	-52,247	-18,331	32,131
2019	54,251	71,711	52,636	38,351	25,105	-49,675	-12,000	41,291

Section VI: Summary of Methodology

This section provides an overview of the analytical approach used in this Review. Appendix A provides an expanded explanation of the statistical transition models, as well as a description of the variables used in those models and how the loan status transition events were constructed. Appendices B, C, and D provide details on the cash flow model and the scenarios for sensitivity analyses. Appendix E describes the loss severity rate model, Appendix F the volume forecast model and Appendix H the equations used to model and project the economic variables in the Monte Carlo simulation.

A. Specification of FHA Mortgage Transition and Termination Models

This Review applies statistical techniques consistent with the literature and applicable to the FHA experience. The purpose of the analysis is to estimate the future incidence of claim and prepayment terminations for FHA forward loans in the mutual mortgage insurance portfolio, so as to compute future outstanding balances, cash flows, and economic values.

The statistical analysis is complicated by the fact that mortgage borrowers possess two mutually exclusive options, one to prepay the loan and the other to default by either temporarily or permanently ceasing payment. From FHA's point of view, prepayment and claim events are the corresponding outcomes of "competing risks" in the sense that they are mutually exclusive, and realization of one of these events precludes the other. Prepayment means cessation of cash flows from mortgage insurance premiums, but thereafter eliminating any chance of incurring claim losses. Conversely, termination through foreclosure or pre-foreclosure sales means claim costs are incurred, but uncertainty about the possibility and timing of prepayment is eliminated.

The models implemented for this Review extend beyond the prepay-claim competing risk framework. The major new transition stage since the 2009 Actuarial Review is the transition from current to 90-days or more delinquent, which we call default. This year, cures from default were separated into cures by heavy modification and cures by light or no modification. We also introduce a "blemished" current status, which is a current loan that has been 90-days or more delinquent at some point in its history.

Also this year, we separated out the transition from current to prepayments that are recaptured into FHA endorsements via streamline refinancing. This transition is used for estimating the origination volume of streamline refinance loans in future books. By making streamline refinancing endogenous, we more accurately capture the future profit and losses of those loans after the current loan is prepaid by the subsequent streamline refinance mortgage.

There are now five possible transitions from a loan in current status: remain current, become blemished current, default (enter 90+ days delinquent), prepay by streamline refinancing, or other prepay (which exits the FHA portfolio). Given that these are mutually exclusive and exhaustive outcomes, the sum of the probabilities for all five transitions is unity. Thus, only four transition equations need to be estimated and the fifth thereby inferred.

For a loan in default status, next quarter it may prepay (streamline refinance is not allowed if delinquent), be claimed, be cured, or remain in default. This year, cures are separated into two types, cures by heavy modification and cures by light or no modification.

As a result, instead of estimating the probabilities of two termination events in the original Calhoun and Deng (2002) model, four probabilities of transition are estimated for each of the current and default statuses.

Following the approach developed by Begg and Gray (1984), we estimated separate conditional binomial logistic models for each transition out of the current or default statuses and then mathematically recombined the parameter estimates to compute the corresponding multinomial logistic probabilities for the various competing risk models of default, cure, claim, and prepayment.

The multinomial logistic models have several benefits over traditional linear regression. First, they ensure that the event probabilities sum to unity. This means that at any point in time, a loan can experience only one of the five possible transitions over the next period. Second, the possible values of each probability are constrained to be between zero and one. Third, as the probability of one transition type increases, the probability of the others is automatically reduced, reflecting the competing-risk nature among the transition events. Finally, they allow the conditional termination rates using loan-level data to be estimated. With loan-level observations, the possible outcomes at each point in time are either 0, the event did not happen, or 1, the event happened. Standard multivariate linear regression analysis is unsuitable for estimating discrete dependent variable models, whereas logistic models are specifically designed to handle these types of observations.

We applied a series of piece-wise linear spline functions to model the impact of all continuous variables, including mortgage age, current LTV, payment-to-income ratio, spread at origination, short-term home price appreciation, relative loan size, original LTV, refinance incentive, and borrower's credit score. An important benefit of the spline specification is that it avoids sudden jumps within a continuous variable. For qualitative or categorical variables, such as season, judicial states, number of units, etc., we adopt the dummy variable specification.

One exception is that we continue to keep the default duration in its categorical instead of a linear spline specification. This is done to keep the simulation speed and the memory capacity of

transition simulations within the capabilities of today's computer technology. As a result, transitions from current status to default and prepayment termination are still modeled as loan-age-dependent probabilities, whereas transitions from default status are modeled as age- and default-duration-dependent events. These transition models include loan-age spline functions and default duration dummy variables.

B. Loan Event Data

We used loan-level data to reconstruct quarterly loan-event histories by relating mortgage origination information to contemporaneous values of time-dependent factors. In the process of creating quarterly event histories, each loan contributed an additional observed "transition" for every quarter from origination up to and including the period of mortgage termination, or until the second quarter of FY 2012 if the loan remained active. The term "transition" is used here to refer to what happens to the loan from the start of one quarter to the start of the next quarter.

The FHA single-family data warehouse records each loan for which insurance has been endorsed and includes additional data fields updating the timing of termination by claim or prepayment. The data warehouse also maintains a record of loans entering and exiting from the default status. See Appendix A for the details of classifying quarters according to their default status.

C. Statistical Sample

The entire population of loan-level data from the FHA single-family data warehouse was extracted for the FY 2012 analysis. This produced a starting population of over 27 million single-family loans originated between FY 1975 through the second quarter of FY 2012. Among these loans, historical status transition records during FY 1996 and later years were reconstructed to estimate the loan status transition models. Our model estimation dataset did not include pre-1996 data due to the limited availability of reliable 90-day default episode data and major change in FHA underwriting policy in FY1996. The resulting dataset was used to generate loan-level transition event histories until the end of the observed data period.

Estimation and forecasting were completed separately for each of the following six FHA mortgage product types:

Product 1	FRM30	Fixed-rate 30-year fully underwritten purchase and refinance
Product 2	FRM15	Fixed-rate 15-year fully underwritten purchase and refinance
Product 3	ARM	Adjustable-rate fully underwritten purchase and refinance
Product 4	FRM30_SR	Fixed-rate 30-year streamlined refinance
Product 5	FRM15_SR	Fixed-rate 15-year streamlined refinance

Product 6	ARM_SR	Adjustable-rate streamlined refinance

In all, there are 8 transition equations to estimate for 6 loan product types, for a total of 48 equations. Appendix A provides additional details on each of the transition types and reports the estimated coefficients for the transition probabilities.

Based on the absolute number of observations by loan type, the following random sampling rates were used for each product to produce the estimation dataset:

Product 1	FRM30	20 percent
Product 2	FRM15	100 percent
Product 3	ARM	100 percent
Product 4	FRM30_SR	100 percent
Product 5	FRM15_SR	100 percent
Product 6	ARM_SR	100 percent

D. Cash Flow Model

After the future default, claim and prepayment rates were projected using the econometric models, the corresponding cash flows were computed. The cash-flow model includes the calculation of five types of cash flows: (1) upfront mortgage insurance premiums, (2) annual mortgage insurance premiums, (3) net claim losses, (4) loss-mitigation-related expenses and (5) premium refunds. Two other cash flows were modeled in some previous Reviews, but are not included in our analyses. The administrative expense was discontinued according to Federal credit reform requirements, and distributive shares were suspended in 1990. There is no indication that either of these will be resumed in the foreseeable future. The Federal credit subsidy present value conversion factors published by the Office of Management and Budget are used in discounting future cash flows to determine their present value as of the end of FY 2012.

E. Loss Severity Rate Model

FHA incurs a loss from a mortgage claim event. This loss amount is highly dependent on many risk factors. The loss severity rate, defined as the loss amount divided by the unpaid principal balance of a loan at the time of claim, has been widely applied by the financial industry, and is highly dependent on the disposition channel. In practice, real-estate-owned (REO) properties resulted from conveyances generally have higher severity compared to pre-foreclosure-sales (PFS). We developed a conditional multiple regression framework to estimate the loss severity rate that makes endogenous the proportion of claims settled by REO and PFS. Thus, this framework consists of three sub-models: an REO/PFS selection model, which predicts the

probability a claim will be disposed as REO or PFS, and separate loss severity rate models for REO and PFS properties. The effective loss rate is the endogenous weighted average of the two separate loss severity rates. The loss severity models captures characteristics of the loan, the collateral house, the borrower, and the housing market environment when a claim occurs. The REO/PFS selection model was estimated using logistic regression, while the two loss severity rate models were estimated using Ordinary Least Squares. Details of the loss severity rate model are provided in Appendix E.

F. Volume Forecast Model

In last year's Review, the IFE Group developed an FHA mortgage volume model in order to project future FHA loan origination volumes, and enhanced it this year. The modeling approach first predicts the (dollar) levels of the national purchase mortgage market volume and the national refinance market volume. Then the third equation projects FHA's fully underwritten refinance share of the national refinance volume. This share is applied to the national refinance volume to project the dollar volume of FHA's fully underwritten refinances. Similarly, FHA's purchase origination volume is calculated by FHA's purchase share of the national purchase volume and the estimated national purchase market volume.

The modeling system varies its predictions according to alternative scenarios for interest rates and home prices. For example, a forecast of higher interest rates would depress refinancing volume. As mentioned above, one enhancement this year is that we endogenously estimate FHA's streamline refinance volume.

G. Monte Carlo Simulation

This year for the first time we estimated the economic value of the Fund using a stochastic, Monte Carlo approach. In prior Reviews, we calculated the present value (PV) of future cash flows based on a single, deterministic path. The Monte Carlo approach uses multiple paths, where a "path" is a set of economic variables whose values are projected out into the future. The set of economic variables that "drive" our behavioral equations—that is, they are critical explanatory variables in our transition, loss severity and volume models—are as follows:

- 1-year Treasury rates,
- 10-year Treasury rates,
- 1-year London interbank overnight rates (LIBOR),
- 30-year fixed rate mortgage (FRM) rates,
- FHFA national house price index (HPI), and
- Unemployment rates.

We use the Moody's baseline path as the mean path for the simulations. We then construct the additional random paths by applying historic dispersion from the mean to the Moody's baseline path. The degree of dispersion is determined by the variances we estimated for the models for each of these six driver variables. The result is a collection of paths that are denser close to the mean path, and less dense further away from the mean path. The models shown in Appendix H define how we generate these multiple random.

Each of the multiple paths are equally likely, so that once the PVs are computed for each path, they are averaged to compute the economic value of the future cash flows. In the literature, this approach is considered the preferred way to compute PVs under uncertainty about future values of the critical driver variables. In particular, this approach accounts for nonlinearities in the way the PVs respond to alternative scenarios (i.e., paths).

Using a stochastic approach requires a great deal of computational power, with the computational time increasing roughly proportional to the number of paths. We have determined that 100 simulated paths are sufficient to estimate accurately the economic value of the future cash flows.

Section VII: Qualifications and Limitations

The actuarial models used in this analysis are based on a theoretical framework and certain assumptions. This framework relates the rates of default, claim, loss and prepayment to a number of individual loan characteristics and certain key macroeconomic variables. The models are calibrated using advanced econometric regression techniques based on data from actual historical experience regarding the performance of FHA-insured mortgage loans. The parameters of the econometric models are estimated over a wide variety of loans originated since 1996 and their performance under the range of economic conditions and mortgage market environments experienced during the past 15 years. The estimated models are used together with assumptions about future loan portfolios and certain key economic assumptions to produce future projections of the performance of the Fund.

The financial estimates presented in this Review require projections of events up to 37 years into the future. These projections are dependent upon the validity and robustness of the underlying models and the assumptions about future economic environments and loan characteristics. These assumptions include economic forecasts by stochastic simulation models and Moody's Economy.com, and assumptions concerning the composition of FHA's future endorsement portfolio supplied by HUD. To the extent that the realized experience deviates from these or other assumptions, the actual results may differ, perhaps significantly, from current projections.

As of this writing, the U.S. housing and mortgage markets are five years into the most stressful economic conditions since the Great Depression. As noted elsewhere in this Review, much of the country remains in the midst of a severe house price decline and it is projected that prices will remain depressed for another year before resuming positive growth. Such extreme conditions have occurred in the last 30 years, but were restricted to certain regions of the country, such as Texas in the mid-1980s, New England in the late 1980s, or California in the early 1990s. It is necessary to go back to the Great Depression to find a housing recession of the magnitude and scale that has been recently experienced. The model used in this Review takes the future projected house price growth rates into account when computing default, claim, loss and prepayment rates.

A. Model Sensitivity to Economic Projections

The main purpose of this Review is to assess the long-term financial performance of the Fund. Two of the critical economic variables used in making these projections are future house prices and future interest rates. This year we have developed stochastic models to project the future distribution of house prices and interest rates using Monte Carlo simulation. Our stochastic models have been calibrated so that they are centered on Moody's July 2012 base case economic

forecasts. Hence the estimated results captured the impact of future deviations from Moody's base case projections.

Our estimate of the Fund's economic value depends on our projected distribution of house prices and interest rates. This dependence is captured mostly by the central core of the distribution which is anchored on Moody's baseline projections. If future realized house prices and interest rates turn out to be more favorable than Moody's projections the Fund will perform better than our base case predicts. Conversely, if future realized house prices and interest rates turn out to be more severe than Moody's projections the Fund will perform worse than our base case predicts.

The results of the stress scenario analyses in Section V represent adverse outcomes in the tail of the projected distribution of house prices and interest rates. The estimates of tail behavior and in particular the estimated probabilities depend on our stochastic models and the procedure we use for fitting the tail behavior.

B. Basic Data Inputs

The econometric analysis in this Review uses a data extract from FHA's data warehouse as of June 30, 2012. The volume and composition of the existing portfolio are also based on FHA data as of June 30, 2012. The future trends of economic conditions are based on July 2012 forecasts by Moody's Analytics. Future endorsement composition data are based on HUD's projections as of August 2012. While we have reviewed the integrity and consistency of these data and believe the data to be reasonable, we have not audited them for accuracy. The information contained in this Review may not correspond exactly with other published analyses that rely on FHA data compiled at different dates or obtained from other data sources.

Section VIII: Conclusions

This Review presents the results of IFE's analysis of the MMI Fund, excluding loans insured under the Home Equity Conversion Mortgage (HECM) Program. The HECM program was included in the MMI Fund starting in FY 2009, but is analyzed in a separate report. Throughout this Review, we have computed the economic value and the unamortized and amortized IIF for the "Fund," which for the purposes of this report includes all forward loans in the MMI Fund and excludes HECMs.

According to our estimates using a stochastic simulation approach, the Fund has an economic value of *negative* $13.48 billion and unamortized IIF of $1,126.27 billion as of the end of FY 2012. Furthermore, we project that the economic value will steadily increase after FY 2012 at an average of $9.67 billion per year to $54.25 billion by the end of FY 2019. Meanwhile, the unamortized IIF will also increase, at an average compound rate of 3.79 percent per year to the end of FY 2019. The faster rate of increase in economic value than in the IIF primarily reflects the stronger financial performance of new books of business projected to be added to the Fund during the next 7 years. The estimate of the FY 2012 economic value is $22.83 billion lower than projected in last year's Review and the estimated FY 2018 economic value is $16.95 billion lower than projected in last year's Review.

As a result of the continued deterioration of the housing market and the global economy during the last five years, the economic value of the Fund has steadily declined to a negative value. Furthermore, under some of the alternative scenarios the economic value of the Fund is projected to be significantly negative and to remain negative for several years.

The credit quality of recent endorsements under the Fund has shown significant improvement over the average credit quality of historical books. Compared to FY 2006-2008 book, FY 2009-2012 book have steadily improved economic value to IIF ratio, due to lower claim loss rate forecast and higher annual insurance premium. HUD forecasts that the credit quality of future books will gradually return to the compositions experienced in the mid-1990s, before the emergence of the subprime markets. The improved credit-risk profile compared to historical levels significantly improves the projected performance of the Fund.

On Aug 12, 2010, Public Law 111-229, was signed to provide the Secretary of HUD with additional flexibility regarding the mortgage insurance premiums for FHA loans. Specifically, the law increased the limit on the size of the annual mortgage insurance premium that HUD is authorized to charge. FHA subsequently increased both the upfront and the annual mortgage insurance premium rates. The increased annual premiums and slow projected prepayment rates make the FY 2012 and projected FY 2013 endorsement books the two most financially robust in FHA's portfolio.

As a result of our continuing effort to improve the accuracy of the analysis, several major model enhancements were implemented this year. First, we moved from a deterministic approach to stochastic simulation approach. The economic value of the Fund is estimated by the expected/average performance of the Fund under 100 possible future economic conditions with different interest rates and house price appreciation rates. Second, we introduced a status called "blemished" current whose future performance would be conditioned by the fact that it was 90-days delinquent within a quarter but kept its current status. Third, the large amount of stressed-loan observations in the past several years enabled us to estimate more precisely the transition probabilities of loans with high probability of negative equity. Fourth, the new loss severity rate model makes endogenous whether a claim would be settled by a pre-foreclosure sale, which has a lower loss severity than on property conveyed to HUD. Finally, future streamline refinance volume is estimated endogenously. This helps to ensure that the profit/loss of the subsequent loan after a streamline refinance is accurately measured and included in the MMI Fund.

The passage of HERA prohibited FHA's endorsement of seller-financed downpayment assistance loans as of October 1, 2008. These loans experienced claim rates that are considerably higher than otherwise comparable non-assisted loans. The share of loans with downpayment assistance from non-profit organizations has declined significantly after the passage of HERA and has been almost zero since FY 2010. This continues to help improve the credit quality of the FHA portfolio, particularly the new books of business to be endorsed in the coming years. The significance of eliminating this program is highlighted by our estimate that if non-profit-assisted loans had always been excluded, the economic value of the Fund would have been positive $1.77 billion in FY 2012, instead of the economic value of *negative* $13.48 billion estimated in this report.

Appendix A
Econometric Analysis of
Mortgage Status
Transitions and Terminations

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Appendix A: Econometric Analysis of Mortgage Status Transitions and Terminations

This appendix describes the technical details of the econometric models used to estimate the historical and future performance of FHA single-family loans for the FY 2012 Review. The models follow those implemented in FY 2011, with a number of enhancements.

The most important model enhancement we made this year was not to the transition models themselves, but to models developed to deploy the transition equations in a different way than in the past. In the past, we computed the net present value of future cash flows along the expected house price/interest rate path to determine the value of those future cash flows. This year, we computed the net present value of those cash flows by averaging their net present values over a number of future house price/interest rate paths, each of which is equally likely. Each path produces a possible future scenario for house prices and interest rates. This distribution is centred on Moody's deterministic forecasts in the sense that our projected values are just as likely to be above Moody's deterministic forecast values as below them. The model equations for doing this are described in Appendix H below.

Another noteworthy model enhancement made this year was to the loss severity model, described in Appendix E later. We developed loss severity equations for REOs, where the property is conveyed to HUD upon default and HUD proceeds to sell it. We also developed different loss severity equations for pre-foreclosure sales (PFSs), where the house is sold by the servicer instead of conveying the property to HUD. These are distinct options open to servicers and PFSs have become a popular and useful method to reduce losses. In order to use these two equations in our simulations of future cash flows along various economic paths, we developed a model that predicts the probability of one method of disposition over the other, i.e., a "choice" model. (This model is discussed in Exhibit A-1 below.)

For the transition equations, this year we made five major enhancements. The first was the introduction of new explanatory variables, in particular, the unemployment rate, the front-end debt-to-income ratio, the current LTV, the spread at origination between the mortgage note rate and the prevailing market rate, house price volatility, house price appreciation, credit burnout, the number of housing units and an ARM payment shock variable.

Second, we split transition to prepayment into two type of terminations: prepayments that are streamline refinance (SR) so that they "return" to the portfolio, and other prepayments that are not SRs. This is important when we simulate the portfolio as an on-going book of business.

Third, we collapsed the three default-to-cure types to two, by adding partial claims to the loan modification category, and adding repayment plans to the self-cure category. This reduced the number of equations to be estimated, without sacrificing accuracy.

The fourth enhancement is the addition of a transition for loans which enter 90-day default but cure in the same quarter. The purpose of this transition is to identify more accurately the

blemished "current" loans, those that have 90-day default episodes but were cured prior to a subsequent 90-day default episode.

The fifth enhancement is the change of estimation period. We excluded loans originated before FY1996 because FHA underwriting policy change in FY 1996 affects the quality of the loans. Also, we excluded the loan experience after FY 2009Q3 when the estimated transition equations emanate from a default status. Because claims that were delayed after FY 2009Q3 would cause the claim rates to be underestimated if those data were included, and could bias other transitions that start with the default status, due to the competing risk approach. These and other changes to the models are discussed in greater details below.

Section I of this appendix summarizes the model specification and estimation issues arising from the analysis of FHA mortgage status transitions and ultimate claim and prepayment rates. We discuss issues related to the measurement of borrower default episodes and prepayment and claim terminations. Although we have expanded the number and types of mortgage statuses, we continue to apply a similar multinomial logistic probability framework that is used to deal with competing risks (as in previous Reviews). This model is "built up" by estimating separate binomial logistic models for each type of mortgage status transition. We discuss the mathematical derivation of the multinomial logistic probabilities from the separate binomial logit estimates. Section II describes the historical loan event history data needed for estimation. The future loan records required for forecasting future loan performance are described in Appendix C. The econometric estimates of the binomial logistic model coefficients are presented in Section III.

I. Model Specification and Estimation Issues

A. Specification of FHA Mortgage Status Transition and Termination Models

Prior to the FY 2010 Review, we used a competing risk framework based on multinomial logistic models for quarterly conditional probabilities of prepayment and claim terminations. The general approach was based on the multinomial logistic models developed by Calhoun and Deng (2002). The multinomial model recognizes the competing risks of prepayment and claim terminations.

Starting in the FY 2010 Review, we introduced a third "competing risk," 90-day delinquency, which we call "default." It is a competing risk in the sense that if the loan is in default for a given quarter, it cannot be prepaid or claimed in that quarter. This new transition state was possible because, combining multiple data sources, FHA developed historical data on new 90-day default episodes that have occurred on outstanding mortgages since FY 1990 Q1. The date on which a loan is first reported to be 90-or-more days in arrears is used to identify the start of a default episode. This default episode continues until the default episode ends or the loan terminates through claim or prepayment. Under our modeling approach, loans that start a quarter in 90-days or more delinquent are deemed to be in default status. Similarly, active loans that are not in a 90-day default episode at the beginning of the quarter are classified as current, even if they go 90-

days delinquent during that quarter. We used the data on 90-day or greater delinquencies to develop an expanded version of the status transition approach that extends the analysis to a transition framework that models eight transitions from current-to-default, current-to-prepay, current-to-streamline refinance, current-to-blemished current, default-to-prepay, default-to-claim, and two types of default-to-current transitions now described. Exhibit A-1 highlights the status transitions that we have modeled for the FY 2012 Review. Note that we now track loans with and without prior default episodes as separate loan status categories, thereby introducing a form of path dependency into the analysis. Loans originating in current status (C) either transition to default status (D) at the start of the next quarter, or terminate as a prepayment to an FHA streamline refinance product (SR), or as a prepayment (PRE) that is not a SR, or default and cure in the same quarter (CX) or continue in current status.

The transition from current into SR or into a non-FHA prepayment is new this year. This allows feedback into an on-going portfolio where future additions to the portfolio are permitted. However, once they enter the two types of prepayment status—and are so recorded—they are merged into a generic prepayment status, indicating that these loans have terminated from the portfolio if future additions are not allowed, importantly as is assumed when the current value of the MMIF is computed.

The CX classification is new this year, and it identifies loans that last year may not have been flagged as having a prior default episode, when following that loan subsequent to that quarter. That is, going in and out of 90-days in the same quarter would not have been recognized as a 90-day episode, since the 90-day status did not continue into the next quarter.

Now all loans that have been in 90-days delinquency but at some point returned to current status are flagged with an "X" and are assigned to a separate current status CX. Loans transition from default status D to status CX along two possible paths, depending on whether they self-cure (CX_S) or cure with a loan modification (CX_M). Repayment plans are added to the self-cure category, and partial claims are added to the loan modification category. This simplified the number of equations we needed to estimate, without sacrificing accuracy.

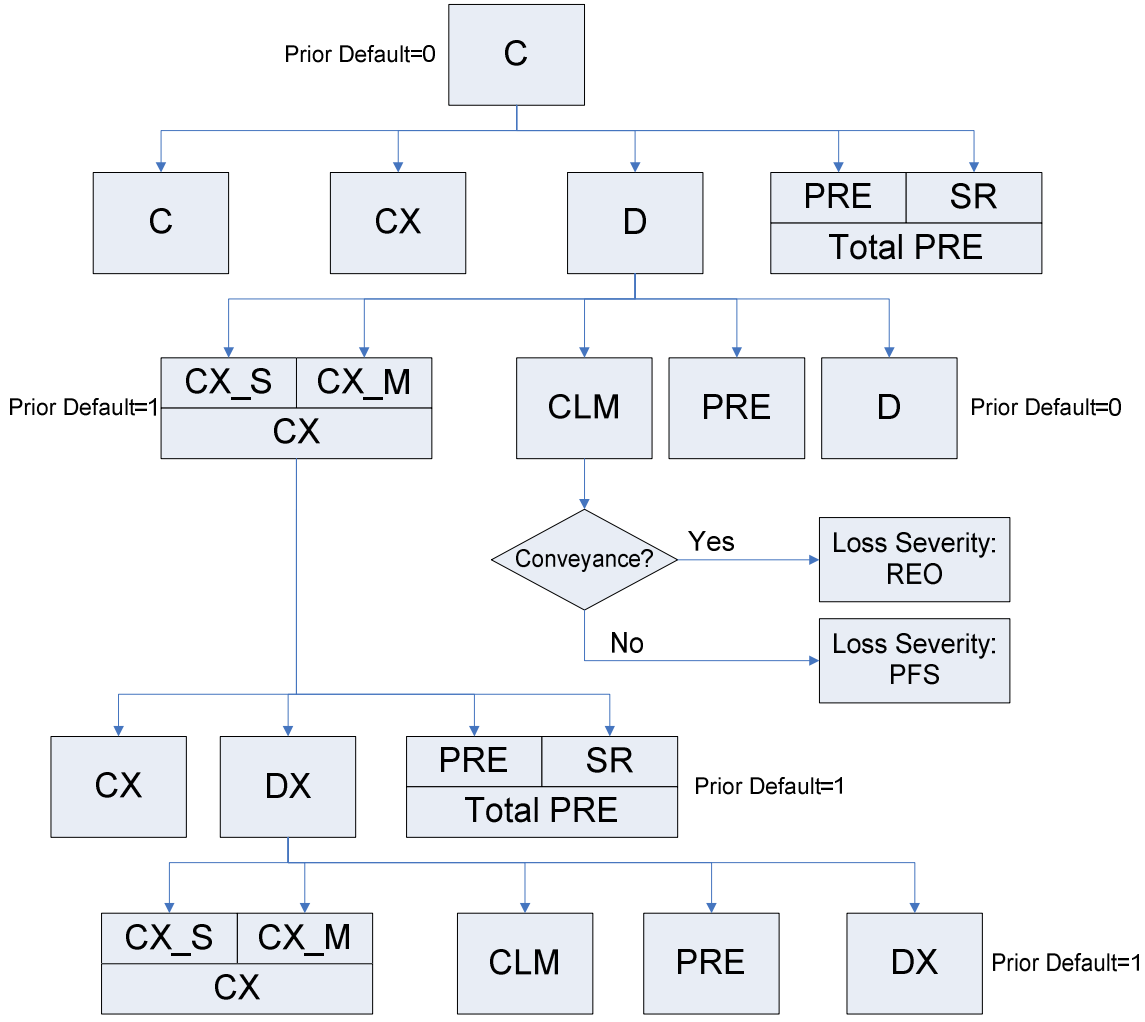
Loans returning to current status along either of these two paths are combined into the single current status CX for modeling subsequent transitions to default or prepayment. While this approach models the transition to these cure types so that the mix of cure types can be identified and modeled, it stops short of expanding the state space to include separate loan statuses for the two cure types. Similarly, loans in current status CX with prior default episodes that re-default are assigned to status DX, the status of default with a prior default episode. As with loans in status D, loans in status DX may also terminate as claims or prepayments.

Note that the prior default episode is modeled as a flag that enters the transition models as an explanatory variable. Transitions from this status are not separately modeled; instead, the flagged loans are added to the un-flagged loans for the next transition. In particular, CX_S is combined with CX_M to form the generic CX, and all the CXs are combined with C. Similarly, DX is combined with D, for purposes of modeling the transitions to the next quarter. Managing the

number of transitions to model is very important for the efficiency of model estimation and application in the simulations of future performance.

Exhibit A-1 shows the enhancement to our loss severity model described in Appendix E that when there is a claim, we model the choice between conveyance of the property to HUD, whence it becomes real estate owned (REO); and pre-foreclosure sale (PFS), where the property is sold by the servicer before it would otherwise be conveyed to HUD. The choice model is new this year as are the separate loss severity equations for REO and PFS.

Exhibit A-1: Loan Status Transitions Framework



In summary, from the current status, there are four possible transitions: CUR_CUR, CUR_D, CUR_PRE and CUR_SR. (Notice the underlining means "transition to" as in CUR (current)

transitions to D (default).) Since the probabilities for each of these transitions must sum to unity, only three of these transition probabilities need to be estimated and the forth inferred. We chose to estimate the latter three and infer from them the CUR_CUR transition probability. Also, we do not introduce separate transitions if the loan starts in a CX status, as that would require three more transition probabilities to estimate and manage in the application of the models for projection purposes. Instead, we incorporated right-hand indicator variables that account for prior default episodes. In other words, we have not expanded the state space to accommodate keeping track the complete information set of prior default episodes, accounting for the different behavior of these loans. Besides, regarding to current status (CUR), we distinguish "clean" current status(C) with a "blemished" current status (CX). We expanded the CUR_CUR transition and used nested logistic regression to model C_CX and C_C transitions.

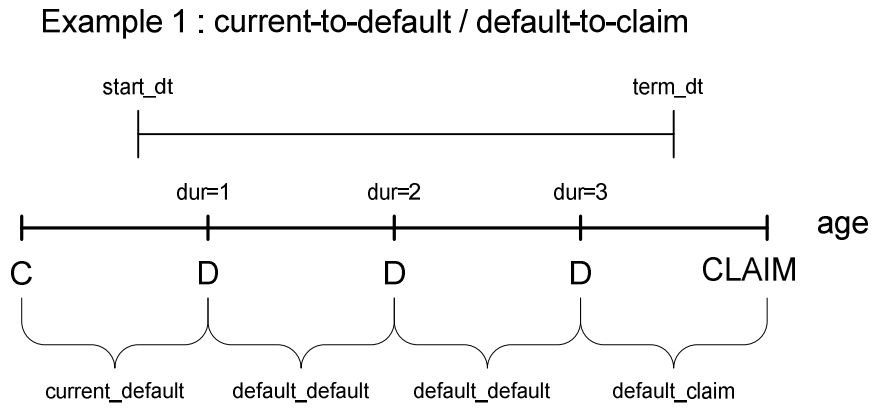
Similarly, there are five possible transitions from a default status: D_D, D_CLM, D_PRE, D_CX_S, D_CX_M. The D_SR transition is not allowed, because loans in default status cannot streamline refinance. Since the sum of the transition probabilities must sum to unity, we did not estimate the D_D transition, but inferred its probability from the other four. And as above, we used right-hand variables to indicate prior default statuses.

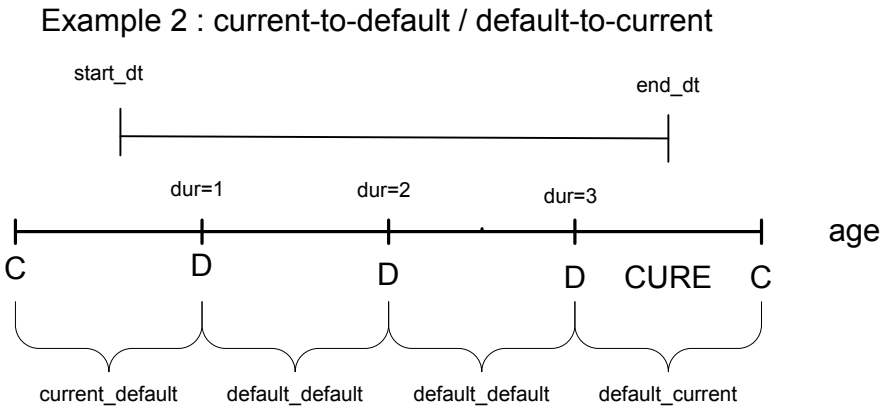
In all, then, there are potential five transitions from current status and five from default, for a total of ten. Two of the probabilities are inferred from the others, so there are eight transition probabilities to estimate for each of the 6 product types. Hence there are 48 equations to estimate.

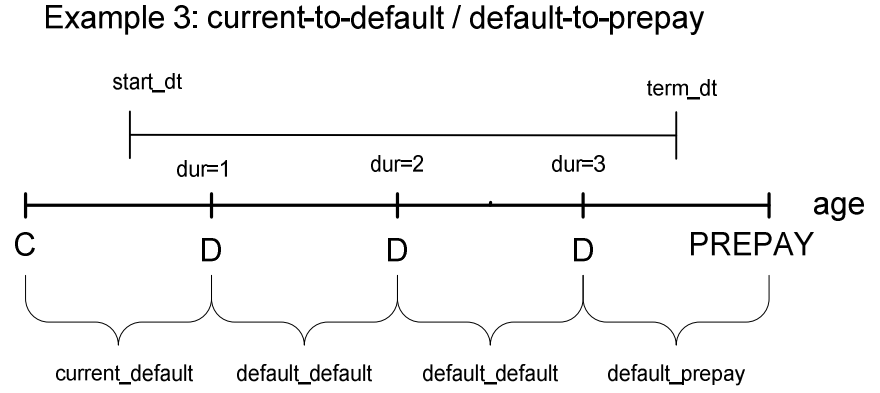
Exhibit A-2 shows five examples of when a loan starts a 90+ episode ("start_dt") and when it ends ("term_dt") when it ends in a claim as in Example 1 or ends as a prepayment in Example 3, "end_dt" when it cures as in Example 2, or "censored" if it does not end at the end of the sample observation period as in Example 4). Note that these examples also help illustrate the notion of default duration ("dur"), which was introduced in the 2010 Review as an explanatory variable in the transition equations. The first four examples were discussed in last year's Review, so we do not discuss them further here.

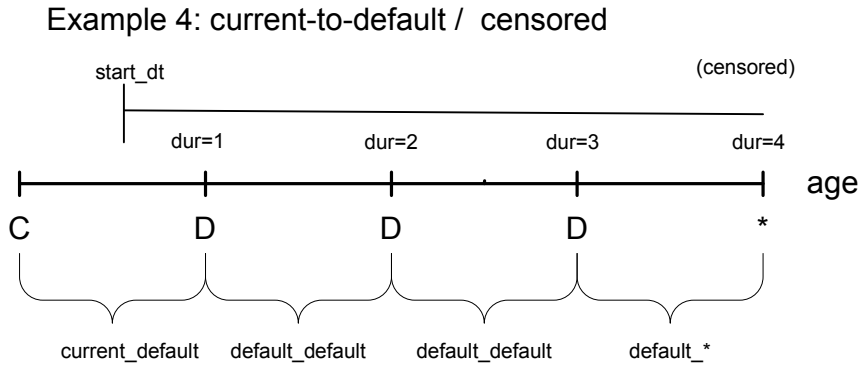
Example 5, however, illustrates one of the new transitions introduced this year, where a loan experiences a 90-day episode within a quarter but it is not 90+ at the end of the quarter. If it were, then the next quarter's status would be default and subsequent cures to current would be marked with an X, as in CX status, indicating that the loan had a prior default episode. However, in the example here, it becomes less than 90-days delinquent before the quarter is over, so under last year's rules, it would never show up later on as having a 90-day episode, which it clearly did. Now we call the subsequent status CX, a "blemished" current status, instead of C as was done last year. An example of a loan going into 90-day status is that a loan is 60-days prior to the quarter, goes to 90- or even 120-days delinquent in the first months of the quarter, and then the arrearages are paid in the last month of the quarter.

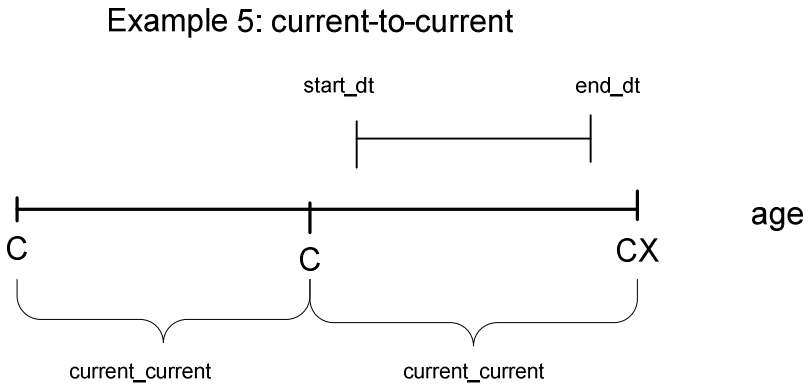
Exhibit A-2: Examples of Loan Transition Types











B. Specification of Multinomial Logistic Models

As summarized above, the status transition framework results in two sets of competing risks: one for loans in current status and the other for loans in default status. For loans current at the start of the quarter, the competing risks are prepayment, transition to default status, or remaining current, as was shown above in Exhibit A-1 in the first layer of transitions. For loans in default status at the start of a quarter, the competing risks are claim, prepayment (delinquent borrowers are ineligible for streamline refinance), transition to current status (cure), or remain in default status, as shown in the second layer of transitions in Exhibit A-1. The number of competing risks includes two possible current types (C and CX, where CX is current but with a prior 90+ default episode) and two possible prepayment types [streamline refinance (SR) and other prepayment (PRE), the sum of which is Total PRE], which are shown in the first layer of transitions of Exhibit A-1; and also two possible cure types [self-cure (s) and loan modification (m)], as shown in the second layer of transitions of Exhibit A-1. This gives rise to eight possible transition probabilities requiring estimation.

We specified multinomial logistic models of quarterly conditional probabilities for transitions from current to prepayment, default, or remaining current; and for transitions from default to claim, prepayment, back to current, or remaining in default. The corresponding mathematical

expressions for the conditional probabilities over the time interval from t to $t+1$ for loans starting in a "clean" current status in a quarter t to other types of prepayment, streamline refinance, default, blemished current, remain "clean" current, respectively, in the subsequent quarter $t + 1$ are given by:

$$\pi_{PRE}^{CUR}(t) = \frac{e^{\alpha_{PRE}^{CUR} + X_{PRE}^{CUR}(t)\beta_{PRE}^{CUR}}}{1 + e^{\alpha_{PRE}^{CUR} + X_{PRE}^{CUR}(t)\beta_{PRE}^{CUR}} + e^{\alpha_{SR}^{CUR} + X_{SR}^{CUR}(t)\beta_{SR}^{CUR}} + e^{\alpha_{DEF}^{CUR} + X_{DEF}^{CUR}(t)\beta_{DEF}^{CUR}}} \quad (1a)$$

$$\pi_{SR}^{CUR}(t) = \frac{e^{\alpha_{SR}^{CUR} + X_{SR}^{CUR}(t)\beta_{SR}^{CUR}}}{1 + e^{\alpha_{PRE}^{CUR} + X_{PRE}^{CUR}(t)\beta_{PRE}^{CUR}} + e^{\alpha_{SR}^{CUR} + X_{SR}^{CUR}(t)\beta_{SR}^{CUR}} + e^{\alpha_{DEF}^{CUR} + X_{DEF}^{CUR}(t)\beta_{DEF}^{CUR}}} \quad (1b)$$

$$\pi_{DEF}^{CUR}(t) = \frac{e^{\alpha_{DEF}^{CUR} + X_{DEF}^{CUR}(t)\beta_{DEF}^{CUR}}}{1 + e^{\alpha_{PRE}^{CUR} + X_{PRE}^{CUR}(t)\beta_{PRE}^{CUR}} + e^{\alpha_{SR}^{CUR} + X_{SR}^{CUR}(t)\beta_{SR}^{CUR}} + e^{\alpha_{DEF}^{CUR} + X_{DEF}^{CUR}(t)\beta_{DEF}^{CUR}}} \quad (1c)$$

$$\pi_{CUR}^{CUR}(t) = \frac{1}{1 + e^{\alpha_{PRE}^{CUR} + X_{PRE}^{CUR}(t)\beta_{PRE}^{CUR}} + e^{\alpha_{SR}^{CUR} + X_{SR}^{CUR}(t)\beta_{SR}^{CUR}} + e^{\alpha_{DEF}^{CUR} + X_{DEF}^{CUR}(t)\beta_{DEF}^{CUR}}} \quad (1d)$$

We further expand quarterly conditional probabilities (1d) into two types, C ("clean current") and CX ("blemished current"), by using nested logistic models.

$$\pi_{CX}^{C}(t) = \frac{e^{\alpha_{CX}^{C} + X_{CX}^{C}(t)\beta_{CX}^{C}}}{1 + e^{\alpha_{CX}^{C} + X_{CX}^{C}(t)\beta_{CX}^{C}}} \quad (1e)$$

$$\pi_{C}^{C}(t) = \frac{1}{1 + e^{\alpha_{CX}^{C} + X_{CX}^{C}(t)\beta_{CX}^{C}}} \quad (1f)$$

The corresponding probabilities for loans starting in a default status transitioning to claim, prepayment, current (self-cured without a partial claim, such as with a repayment plan), current (via a partial-claim modification), and continuing in default status are given by, respectively:

$$\pi_{CLM}^{DEF}(t) = \frac{e^{\alpha_{CLM}^{DEF} + X_{CLM}^{DEF}(t)\beta_{CLM}^{DEF}}}{1 + e^{\alpha_{CLM}^{DEF} + X_{CLM}^{DEF}(t)\beta_{CLM}^{DEF}} + e^{\alpha_{PRE}^{DEF} + X_{PRE}^{DEF}(t)\beta_{PRE}^{DEF}} + e^{\alpha_{CUR\_S}^{DEF} + X_{CUR\_S}^{DEF}(t)\beta_{CUR\_S}^{DEF}} + e^{\alpha_{CUR\_M}^{DEF} + X_{CUR\_M}^{DEF}(t)\beta_{CUR\_M}^{DEF}}} \quad (2a)$$

$$\pi_{PRE}^{DEF}(t) = \frac{e^{\alpha_{PRE}^{DEF} + X_{PRE}^{DEF}(t)\beta_{PRE}^{DEF}}}{1 + e^{\alpha_{CLM}^{DEF} + X_{CLM}^{DEF}(t)\beta_{CLM}^{DEF}} + e^{\alpha_{PRE}^{DEF} + X_{PRE}^{DEF}(t)\beta_{PRE}^{DEF}} + e^{\alpha_{CUR\_S}^{DEF} + X_{CUR\_S}^{DEF}(t)\beta_{CUR\_S}^{DEF}} + e^{\alpha_{CUR\_M}^{DEF} + X_{CUR\_M}^{DEF}(t)\beta_{CUR\_M}^{DEF}}} \quad (2b)$$

$$\pi_{CUR\_S}^{DEF}(t) = \frac{e^{\alpha_{CUR\_S}^{DEF} + X_{CUR\_S}^{DEF}(t)\beta_{CUR\_S}^{DEF}}}{1 + e^{\alpha_{CLM}^{DEF} + X_{CLM}^{DEF}(t)\beta_{CLM}^{DEF}} + e^{\alpha_{PRE}^{DEF} + X_{PRE}^{DEF}(t)\beta_{PRE}^{DEF}} + e^{\alpha_{CUR\_S}^{DEF} + X_{CUR\_S}^{DEF}(t)\beta_{CUR\_S}^{DEF}} + e^{\alpha_{CUR\_M}^{DEF} + X_{CUR\_M}^{DEF}(t)\beta_{CUR\_M}^{DEF}}} \quad (2c)$$

$$\pi_{CUR\_M}^{DEF}(t) = \frac{e^{\alpha_{CUR\_M}^{DEF} + X_{CUR\_M}^{DEF}(t)\beta_{CUR\_M}^{DEF}}}{1 + e^{\alpha_{CLM}^{DEF} + X_{CLM}^{DEF}(t)\beta_{CLM}^{DEF}} + e^{\alpha_{PRE}^{DEF} + X_{PRE}^{DEF}(t)\beta_{PRE}^{DEF}} + e^{\alpha_{CUR\_S}^{DEF} + X_{CUR\_S}^{DEF}(t)\beta_{CUR\_S}^{DEF}} + e^{\alpha_{CUR\_M}^{DEF} + X_{CUR\_M}^{DEF}(t)\beta_{CUR\_M}^{DEF}}} \quad (2d)$$

$$\pi_{DEF}^{DEF}(t) = \frac{1}{1 + e^{\alpha_{CLM}^{DEF} + X_{CLM}^{DEF}(t)\beta_{CLM}^{DEF}} + e^{\alpha_{PRE}^{DEF} + X_{PRE}^{DEF}(t)\beta_{PRE}^{DEF}} + e^{\alpha_{CUR\_S}^{DEF} + X_{CUR\_S}^{DEF}(t)\beta_{CUR\_S}^{DEF}} + e^{\alpha_{CUR\_M}^{DEF} + X_{CUR\_M}^{DEF}(t)\beta_{CUR\_M}^{DEF}}} \quad (2e)$$

The constant terms α_f^i and coefficient vectors β_f^i are the unknown parameters to be estimated for the multinomial logistic model for starting status *i* indicating current (CUR) or default (DEF); and ending status *f* indicating claim (CLM), prepayment (PRE), streamline refinance (SR), default, ,remain current without getting into 90day delinquency(C), and self-cure in the same quarter (CX), two types of current/cure (CUR) if coming from a default status in the previous quarter, or default (DEF). We denote by $X_f^i(t)$ the vector of explanatory variables for the conditional probability of making a transition from starting status *i* to ending status *f*. Some components of the $X_f^i(t)$ are constant over the life of the loan and therefore do not vary with time period t. The "dynamic" or time-varying explanatory variables in $X_f^i(t)$ include mortgage age, the duration of the default episode for loans in default status and the existence of prior default episodes.

As illustrated in Exhibit A-1, for the FY 2012 Review actuarial projections we ultimately stratify initial current status (CUR) by whether the loan had a prior default episode (CUR_X). As discussed further below, the econometric equations (1a) - (1d) and (3a) - (3c) for loans in current status (CUR) presented above were estimated using pooled samples of loans with and without prior default episodes and the explanatory variables in $X_f^i(t)$ include an indicator (dummy variable) for whether the loans had a prior default episode. However, we distinguish the current to current status transition into two possible ending statuses - whether the loan experienced a prior default episode (CX) or without a prior default episode(C). As noted, subsequent transitions from current status only use a current status (C) with no 90-day delinquency distinction. The econometric equations (3d) for loans in current status (C) presented above were estimated only using pooled samples of loans without prior default episodes. Thus, modeling two types of current to current transitions C to C and C to CX is a nested logistic model while modeling the first level current to current transition is treated as an alternative event of current to default, current to streamline refinance, current to prepayment and current to claim. Equations (1e) and (1f) illustrate this relationship.

For this Review we have expanded the possible ending statuses for cures to include two possible cure types – self cure or non-mod foreclosure alternative (CUR_S) and modification cure (CUR_M). As noted, subsequent transitions from current status use a combined current status (CUR) definition. Thus, while we model different rates of transition from default-to-current by cure type, we have not stratified the current status by cure type. Stratifying current status by both cure types and prior default history would have expanded the overall state space beyond manageable dimensions. However, modeling default-to-current transitions by cure type has the advantage that we can project the future mix of cure types and their different relative rates of transition to current status based on their historical patterns. This aspect of the model is discussed further in Section A.2 of this appendix as it relates to the included explanatory variables.

C. Computation of Multinomial Logit Parameters from Binomial Logit Parameters

As in prior-year Reviews, we apply an approach developed by Begg and Gray (1984), in which we estimate separate binomial logistic models for each possible transition type and then recombine the estimates to derive the multinomial logistic probabilities. Begg and Gray (1984) applied Bayes Law for conditional probabilities to demonstrate that the values of parameters α_f^i and β_f^i estimated from separate binomial logistic (BNL) models are parametrically equivalent to those for the corresponding multinomial logistic (MNL) model once appropriate calculations are performed. Assume that the conditional probabilities for current-to-prepay and current-to-default transitions for separate BNL models for loans in current status at the start of quarter *t* are given, respectively, by:

$$\Pi_{PRE}^{CUR}(t) = \frac{e^{\alpha_{PRE}^{CUR} + X_{PRE}^{CUR}(t)\beta_{PRE}^{CUR}}}{1 + e^{\alpha_{PRE}^{CUR} + X_{PRE}^{CUR}(t)\beta_{PRE}^{CUR}}} \tag{3a}$$

$$\Pi_{SR}^{CUR}(t) = \frac{e^{\alpha_{SR}^{CUR} + X_{SR}^{CUR}(t)\beta_{SR}^{CUR}}}{1 + e^{\alpha_{SR}^{CUR} + X_{SR}^{CUR}(t)\beta_{SR}^{CUR}}} \tag{3b}$$

$$\Pi_{DEF}^{CUR}(t) = \frac{e^{\alpha_{DEF}^{CUR} + X_{DEF}^{CUR}(t)\beta_{DEF}^{CUR}}}{1 + e^{\alpha_{DEF}^{CUR} + X_{DEF}^{CUR}(t)\beta_{DEF}^{CUR}}} \tag{3c}$$

$$\Pi_{CX}^{C}(t) = \frac{e^{\alpha_{CX}^{C} + X_{CX}^{C}(t)\beta_{CX}^{C}}}{1 + e^{\alpha_{CX}^{C} + X_{CX}^{C}(t)\beta_{CX}^{C}}} \tag{3d}$$

where we have used an upper-case Π to indicate the binomial logistic probability and distinguish it from the lower-case π that was used above to denote the multinomial logistic probabilities. The corresponding binomial probabilities for transitions from default status to claim, prepayment, or current status are given by:

$$\Pi_{CLM}^{DEF}(t) = \frac{e^{\alpha_{CLM}^{DEF} + X_{CLM}^{DEF}(t)\beta_{CLM}^{DEF}}}{1 + e^{\alpha_{CLM}^{DEF} + X_{CLM}^{DEF}(t)\beta_{CLM}^{DEF}}} \tag{4a}$$

$$\Pi_{PRE}^{DEF}(t) = \frac{e^{\alpha_{PRE}^{DEF} + X_{PRE}^{DEF}(t)\beta_{PRE}^{DEF}}}{1 + e^{\alpha_{PRE}^{DEF} + X_{PRE}^{DEF}(t)\beta_{PRE}^{DEF}}} \tag{4b}$$

$$\Pi_{CUR\_S}^{DEF}(t) = \frac{e^{\alpha_{CUR\_S}^{DEF} + X_{CUR\_S}^{DEF}(t)\beta_{CUR\_S}^{DEF}}}{1 + e^{\alpha_{CUR\_S}^{DEF} + X_{CUR\_S}^{DEF}(t)\beta_{CUR\_S}^{DEF}}} \tag{4c}$$

$$\Pi_{CUR\_M}^{DEF}(t) = \frac{e^{\alpha_{CUR\_M}^{DEF} + X_{CUR\_M}^{DEF}(t)\beta_{CUR\_M}^{DEF}}}{1 + e^{\alpha_{CUR\_M}^{DEF} + X_{CUR\_M}^{DEF}(t)\beta_{CUR\_M}^{DEF}}} \tag{4d}$$

Estimation of the binomial logistic (BNL) probabilities in (3a) - (3c) and (4a) - (4d) produces estimates of parameters α_f^i and β_f^i that can be substituted directly into equations (1a) - (1d) and (2a) - (2e) to derive the corresponding multinomial logistic (MNL) probabilities .There are two sets of αs and βs, one each for the BLM and the MLM, but rather than further encumber our already cumbersome notation to distinguish these two sets, we let the context make it clear which is which. Also estimation of nested logistic probabilities in (3d) and first level of probability (1d) can derive the corresponding multinomial logistic (MNL) probabilities.

D. Loan Transition and Event Data

We used loan-level data to construct quarterly loan event histories by combining mortgage origination information with contemporaneous values of time-dependent factors. In the process of creating quarterly event histories, each loan contributed an observed "transition" for every quarter from origination up to and including the period of mortgage termination, or until the last time period of the historical data sample. The term "transition" is used here to refer to any situation in which a loan remains active and the loan status changes prior to the start of the next quarter, or in which terminal claim or prepayment events are observed in the current quarter.

The FHA single-family data warehouse records each loan for which insurance was endorsed and includes data fields that record changes in the status of the loan. The historical data used in model estimation for this Actuarial Review is based on an extract from FHA's database as of June 30, 2012.

E. Data Samples

A full 100-percent sample of loan-level data from the FHA single-family data warehouse was extracted for the FY 2012 analysis. This produced a very large sample of approximately 27.47 million single-family loans originated between the first quarter of FY 1975 and the second quarter of FY 2012. We used data for 15.54 million loans originated during and after FY 1996 to FY 2011 to estimate the status transition models starting in current status and 12.19 million loans originated during FY1996 to FY2009Q3 to estimate the status transition models that depict starting from default status that transition to other statuses, corresponding to the loan cohorts for which complete data were available on new 90-day default episodes. These data were used to generate quarterly loan-level event histories for up to the lesser of the age at which the loan claimed or fully prepaid, the age at which the loan would mature based on the original term of the loan, and the end of the historical sample period. We used a different period to estimate transition equations because we observed many delayed claims after FY2009Q3, which would cause bias in the default-to-claim transition if those data were included. This in turn would cascade the bias to other transitions that start with the default status, due to the competing risk approach that estimates the transition coefficients.

Estimation and forecasting was undertaken separately for each of the following six FHA mortgage product types:

Product 1	FRM30	Fixed-rate 30-year fully underwritten purchase and refinance
Product 2	FRM15	Fixed-rate 15-year fully underwritten purchase and refinance
Product 3	ARM	Adjustable-rate fully underwritten purchase and refinance
Product 4	FRM30_SR	Fixed-rate 30-year streamlined refinance
Product 5	FRM15_SR	Fixed-rate 15-year streamlined refinance
Product 6	ARM_SR	Adjustable-rate streamlined refinance

The following sampling rates were used for each product to produce the estimation dataset:

Product 1	FRM30	20percent
Product 2	FRM15	100 percent
Product 3	ARM	100 percent
Product 4	FRM30_SR	100 percent
Product 5	FRM15_SR	100 percent
Product 6	ARM_SR	100 percent

II. Explanatory Variables

Four categories of explanatory variables were employed:

- Fixed initial loan characteristics including mortgage product type, purpose of loan (home purchase or refinance), amortization term, origination year and quarter, original loan-to-value (LTV) ratio, original loan amount, original mortgage interest rate, spread at origination and relative house price level by geographic location (MSA, state or Census division);

- Fixed initial borrower characteristics including borrower credit scores and indicators of the source of downpayment assistance (additional discussion of borrower credit scores and downpayment assistance is provided below);

- Dynamic variables based entirely on loan information including mortgage age, duration of default episode, whether a loan has had a prior default episode, season of the year, and scheduled amortization of the loan balance; and

- Dynamic variables derived by combining loan information with external economic data including interest rates and house price indexes.

In some cases the two types of dynamic variables are combined, as in the case of adjustable-rate mortgage (ARM) loans where external data on changes in one-year Treasury yields are used to update the original coupon rates and payment amounts in accordance with standard FHA loan contract features. This in turn affects the amortization schedules of the loans.

We account for variation in FHA loss mitigation activities by estimating two separate cure-types equations, as summarized in equations (2c), and (2d). The model now estimates the direct impact of prior default episodes and develops separate actuarial projections for loans with and without prior default episodes and is therefore much more sensitive to the conditions during the recent crisis.

Exhibits A-3.1 through A-3.6 summarize the explanatory variables that were used in the statistical modeling of loan status transitions and present the coefficient estimates for the 42 binomial logistic models. While we continue to employ some categorical (dummy) variables, we converted most categorical variables into spline variables, such as relative spread, burnout factor, yield curve slope, etc. Also we constrained some variables, such as the current loan-to-value ratio, at certain levels because of thin data over the extreme values of these variables. In the case of the CLTV, this actually results in a slightly more parsimonious model.

Also we have included many new explanatory variables, which help the model in-sample fit significantly. Most of these variables are introduced as splines. Additional details on each set of variables are provided below, with the newly added variables first.

Unemployment Rate

There is ample literature that indicates job loss, or loss of income, is one of the major trigger events for mortgage default. The natural choice of macroeconomic variables to capture this effect is the unemployment rate. However, during the period of 1994-2008, when the U.S. economy grew at a steady speed and only experienced a minor recession, the variation in the unemployment rate was extremely small, which makes it difficult to demonstrate that it is a significant factor. Actually, the national unemployment rate in that period was almost always between 4% and 6%. That is part of the reason why previous attempts to use this variable showed it as not statistically significant. After 2008, the unemployment rate rose rapidly, and consequently we found this variable to be both statistically and economic significant in the borrower's default behavior.

The current Review introduced two types of unemployment rate: short-term unemployment rate change, *Delta_UE(t)*, and a relative unemployment rate, *Relative_UE(t)*. The short-term unemployment rate change is measured as the change in the unemployment rate level between last quarter and the level three quarters ago, which indicates the direction of change in unemployment. The relative unemployment rate is measured as the ratio between the unemployment rate level in last quarter, *UE(t-1)*, and the moving average over the last 10 years, *UE_10yr_avg(t)*, which indicates the inventory of unemployment. For example, although the quarterly change in the unemployment rate did not vary much after year 2008, the relative

unemployment rate continued to climb due to the recession. The formulas for computing these two new measures are:

$$Delta\_UE(t) = UE(t\text{-}1) - UE(t\text{-}3)$$

$$\text{Re}lative\_UE() = \frac{UE(t\text{-}1)}{UE\_10yr\_avg(t)}$$

Debt-to-Income (DTI) Ratio

The DTI ratio measures the ratio of monthly debt payment to before-tax total household income. There are two ratios available: front-end ratio, which counts only the mortgage-related housing cost, i.e. PITI (principal, interest, tax, insurance), and the back-end ratio, which includes all other regular monthly debt payments, including car loans, student loans, and credit cards. We use the front-end ratio to capture the debt burden effect for the borrower, because it is better documented, and measured more accurately than the back-end ratio.

Current Loan-to-Value (CLTV) Ratio

This is the major variable we introduced in this FY 2012 Review. This variable is calculated as the origination Loan-to-Value (OLTV), divided by the appreciation factor since origination (i.e., inflating—or deflating—the denominator, the house price), adjusted for amortization. Empirical results show that the mortgage default rate is very sensitive to the CLTV ratio, when the property value moves into the negative equity range (at CLTV=100%). This empirical result is consistent with option theory, when the put/default option is in-the-money when the property is "under-water," and the borrower would has a financial incentive to exercise this option. The CLTV variable is a more direct way to capture the borrower's incentive to default than is the probability of negative equity variable (PNEG) used in prior Reviews. (PNEG is still used herein, in the current-to-prepay transitions.)

CLTV was used as a continuous variable for transitions to prepayment and to cure (both self and modifications), but because of thin data at high CLTVs, we used splines and constrained the CLTV function at a fixed level for transitions to default and to claim (all such transitions except for FRM15, FRM SR and ARM SR, where one of the transitions current to default and default to claim was not capped). For example, we applied a piece-wise linear spline function for the default-to-claim transition for FRM30 loans with knots (the k's) of 0.6and 1.0 and constrained the CLTV function at its value at knot 1.0 for CLTVs above 1.0. The spline function with two knots k_1 and k_2 is specified as follows, where *cltv* is the continuous CLTV variable:

$$\text{cltv1} = \begin{cases} \text{cltv} & \text{if cltv} \le \text{k}_1 \\ \text{k}_1 & \text{if cltv} > \text{k}_1 \end{cases}$$

$$\text{cltv2} = \begin{cases} 0 & \text{if cltv} \le \text{k}_1 \\ \text{cltv} - \text{k}_1 & \text{if k}_1 < \text{cltv} \le \text{k}_2 \\ \text{k}_2 - \text{k}_1 & \text{if cltv} > \text{k}_2 \end{cases}$$

$$\text{cltv3} = \begin{cases} 0 & \text{if cltv} \le \text{k}_2 \\ \text{cltv} - \text{k}_2 & \text{if cltv} > \text{k}_2 \end{cases}$$

Coefficient estimates for each variable are the slopes of the line segments between each knot point. They were estimated for each product and transition type combination and, except for the exceptions noted above that use the linear form, they are reported in Exhibit A-3. The overall generic CLTV function for the 3-cltv segment example is given by:

$$\text{CLTVFunction} = \beta_1 \cdot \text{cltv1} + \beta_2 \cdot \text{cltv2} + \beta_3 \cdot \text{cltv3}$$

This function is estimated as a set of three variables in each binomial equation. For those cases where we capped the effect of CLTV at high levels (above the last knot point), we set the estimate of β_3 to zero.

Home Price Volatility

Option theory predicts that the put (default) option value would increase when the collateral volatility increases, everything else equal. Empirical result shows the marginal effect of home price volatility on default behavior is generally positive, which is consistent with option theory. An easier way to interpret this phenomenon is that the home price volatility measures our uncertainty in calculating the updated property value; higher volatility would introduce more error on both positive and negative sides. However, the loss introduced on the negative side is not compensated enough by the gain on the positive side. The home price volatility is the same as the measurement of parameters "*a*" calculated in Probability of Negative Equity, which indicates uncertainty with regard to the dispersion of individual house price appreciation rates around the market average, represented by the local-level HPI. And the parameters "*a*" is estimated by FHFA when applying the three-stage weighted-repeat-sales methodology advanced by Case-Shiller (1987, 1989).

Home Price Appreciation

The home price enters the model via two variables, each of which has a different interpretation. Home price appreciation since origination determines the CLTV ratio, which is used to measure the equity level of the property. Short-term home price appreciation, which proxies for people's expectation on home price movement, also enters the equation. The rationale for this variable is that people make their decisions not only on the realized historical information, but also on their expectation about future home price appreciation. Short-term home price appreciation, HPA2y(t), is calculated as the projected house price index one year ahead, HPI(t+4), divided by historical house price index one year ago, HPI(t-4), measured at both the national level and at the Metropolitan Statistical Area (MSA) level, HPI(i):

$$\text{HPA2y(t,i)} = \frac{\text{HPI(t+4,i)}}{\text{HPI(t-4,i)}}$$

When historical observations are used to estimate the transition equations, actual four-quarter-ahead observations are used to measure this variable. For simulations along HPA/interest rate paths, the same measurement is made, using the projected HPAs four-quarters ahead.

Relative Loan Size

This variable is measured as the mortgage origination amount, divided by the average loan origination amount in the same state for the same fiscal year. This replaces the relative house price variable used in last year's Review. Empirical results show this variable is very significant in prepayment-related termination. That is consistent with option theory, since loans with higher loan size could achieve higher monetary savings, given the same relative mortgage spread. For hypothetical loans originated after FY2012 Q2, we applied relative loan size assumptions consistent with the loans originated during FY2011Q3 to FY2012Q2.

Spread at Origination/SATO

SATO is measured as the spread between the mortgage note rate, C and the prevailing mortgage rate, R, at the time of origination. It is widely regarded as the lender surcharge for additional borrower risk characteristics, which are not captured by standard underwriting data, i.e. FICO score, OLTV, DTI ratio, documentation level, etc. A high SATO loan is generally more risky, compared to a similar loan with low SATO. Some researchers also argue that a high SATO is an indicator of predatory lending, which also tends to increase the credit risk.

$$\text{SATO} = \text{C} - \text{R}$$

Credit Burnout

Burnout is a relatively well understood concept in prepayment modeling: loans which have forgone refinance opportunities in the past are less likely to refinance in the future. Similarly, loans which have forgone a default option and show resilience to make continuous payments in the past are less likely to default in the future. We use the cumulative number of quarters that a property has been "under-water" to proxy this effect.

Property Type

We include property type (number of units) into our transition model framework. Multi-unit single family properties (2, 3, 4 units) are generally partially rental properties. The volatility of the rental income, combined with idiosyncratic risk of the properties, tends to increase the default risk for these loans and reduce the prepayment propensity.

FHA Score Indicator

FHA adopted a number of changes in FY 2005 with potential impacts on underwriting, including implementation of its TOTAL scorecard. So this dummy variable is defined as unity if the loan was originated after FY2004, zero otherwise.

Specification of Piece-Wise Linear Age Functions

Exhibit A-3 lists the series of piece-wise linear age functions that were used for each of the loan status transitions for each of the six different mortgage product types. For example, we applied a piece-wise linear age function for current-to-streamline refinance transitions of FRM30 loans with knots (the k's) at ages 2, 5 and 10 quarters by generating 4 new age variables age1 to age4 defined as follows:

$$\text{age1} = \begin{cases} \text{AGE} & \text{if AGE} \le k_1 \\ k_1 & \text{if AGE} > k_1 \end{cases}$$

$$\text{age2} = \begin{cases} 0 & \text{if AGE} \le k_1 \\ \text{AGE} - k_1 & \text{if } k_1 < \text{AGE} \le k_2 \\ k_2 - k_1 & \text{if AGE} > k_2 \end{cases} \qquad (5)$$

$$\text{age3} = \begin{cases} 0 & \text{if AGE} \le k_2 \\ \text{AGE} - k_2 & \text{if } k_2 < \text{AGE} \le k_3 \\ k_3 - k_2 & \text{if AGE} > k_3 \end{cases}$$

$$\text{age4} = \begin{cases} 0 & \text{if AGE} \le k_3 \\ \text{AGE} - k_3 & \text{if AGE} > k_3 \end{cases}$$

Coefficient estimates for each variable are the slopes of the line segments between each knot point and for the last open-ended segment. They were estimated for each product and transition type combination and reported in Exhibit A-3. The overall generic AGE function for the 4-age segment example described above is given by:

$$\text{AgeFunction} = \beta_1 \cdot \text{age1} + \beta_2 \cdot \text{age2} + \beta_3 \cdot \text{age3} + \beta_4 \cdot \text{age4} \quad (6)$$

Age functions with fewer numbers of segments were developed in a similar manner. The number of segments and the selection of the knot points were determined by testing alternative specifications and assessing the reasonableness of the resulting functions. For some products and transition types the age functions were omitted altogether due to the instability or statistical insignificance of the estimated parameters.

Specification for Default Durations

The same approach was adopted for specifying default duration functions as in the FY2011 Review. Our research indicated that the default duration function behaves differently, in terms of both magnitude and shape, for loans in states with judicial foreclosure, given the longer time frame typically associated with legal proceedings. To provide additional flexibility in the duration functions, we interacted the duration functions with the dummy variable that indicated whether the loan is located in a state utilizing judicial foreclosure. Instead of applying a piece-wise linear spline function, we used a series of dummy variables for durations 1, 2, 3, and 4-or-more quarters. For the judicial and non-judicial state variable, we combined the duration 0 and 1 categories into a single category. The omitted baseline category is loans in non-judicial foreclosure states with default duration less than or equal to 1.

We continue to limit the maximum duration category to 4 (or more) quarters. This approach was adopted to reduce the dimensions of the matrix of transition probabilities to be generated during the forecast involving product and transition types, mortgage age and duration. Thus, all loans in default status at duration 4 or higher at the start of a quarter are assigned to the same duration category. This implies that the duration impact will be constant for durations 4 and higher, and the level the function has attained by duration 4 will be applied to all higher durations, if the loan should survive and continue in default status to these higher durations. The same constraint was applied in the FY2011 Review, as the final segment of the piece-wise linear spline applied in last year's Review was constrained to have a slope of zero.

Loan-to-Value Ratio

The initial LTV is recorded in FHA's data warehouse. For fully underwritten mortgage products and streamline refinance loans with required appraisals these LTV values are used directly. Following the approach adopted for the FY 2011 review, for streamline refinance loans without required appraisals, we have linked the streamline refinance loans with the original fully

underwritten FHA mortgage to the same borrower, and used the information from this original loan as the starting point for updating the probability of negative equity for streamline refinance mortgages and CLTVs. If the previous mortgage was also a streamline refinance mortgage we kept going back until we reached the original fully underwritten mortgage.

Season

The season of an event observation quarter is defined as the season of the year corresponding to the calendar quarter, where season 1 = Winter (January, February, March), 2 = Spring (April, May, June), 3 = Summer (July, August, September), and 4 = Fall (October, November, December). All categorical (0-1 dummy) variables take on the value of 1 for the specified quarter; and one of the categories is omitted as the reference category.

Probability of Negative Equity

Following the approach of Deng, Quigley, and Van Order (2000), Calhoun and Deng (2002), and others, we computed the equity positions of individual borrowers using *ex ante* probabilities of negative equity. The probability of negative equity is a function of the current loan balance and is the probability of individual house price outcomes below this value during the quarter of observation. The distributions of individual housing values relative to the value at mortgage origination were computed using estimates of house price drift and volatility based on FHFA (formerly OFHEO) House Price Indexes (HPIs).

The probability of negative equity is computed as:

$$PNEQ = \Phi\left\{\frac{\ln(UPB(t)) - \ln(P(0)\cdot HPI(t))}{\sigma(t)}\right\} \qquad (7)$$

where $\Phi(x)$ is the standard normal cumulative distribution function evaluated at *x*, *UPB(t)* is the current unpaid mortgage balance based on scheduled amortization, *P(0)* is the value of the borrower's property at mortgage origination, *HPI(t)* is an index factor for the housing prices in the local market since loan origination, and $\sigma(t)$ is a measure of the diffusion volatility for individual house price appreciation rates over the same period of time. The values of *HPI(t)* are computed directly from the house price indexes published by FHFA, while the diffusion volatility is computed from the following equation:

$$\sigma(t) = \sqrt{a\cdot t + b\cdot t^2}\ . \qquad (8)$$

The parameters "*a*" and "*b*" in this expression were estimated by FHFA when applying the three-stage weighted-repeat-sales methodology advanced by Case-Shiller (1987, 1989). Further details on the original FHFA HPI methodology can be found in Calhoun (1996).

Mortgage Premium (Refinance Incentive)

The financial incentive of a borrower to refinance is measured using a variable for the relative spread between the current mortgage contract interest rate *C(t)*, which for FRMs equals *C(0)*, and the current market mortgage rate *R(t)*:

$$MP(t) = \left\{ \frac{C(t) - R(t)}{C(t)} \right\}. \tag{9}$$

This variable is as an approximation to the call option value of the mortgage given by the difference between the present value of the "anticipated" future stream of mortgage payments discounted at the current market rate of interest, *R(t)*, and the present value of the mortgage evaluated at the current note rate, *C(t)*. Additional details are given in Deng, Quigley, and Van Order (2000) and Calhoun and Deng (2002).

ARM Payment Shock

This variable is as an approximation to the call option value of the quarterly mortgage payment, PMT, calculated by amortization schedule and driven by the difference between the ARM coupon rates, C(t) (that are updated over the life of mortgage as described below) and initial contract rates, C(0):

$$pmt\_shock(t) = \left\{ 100 * \frac{PMT(t) - PMT(0)}{PMT(0)} \right\}. \tag{10}$$

This variable is typically reserved to predict defaults, but over most of the estimation period, rates have fallen, and it is not statistically significant in the equation. We found it useful for the ARM prepayment transition, and it was used along with the above mortgage premium variable.

ARM Coupon Rate Dynamics

To estimate the current financial value of the prepayment option for ARM loans, and to compute amortization rates that vary over time, we tracked the path of the coupon rate over the active life of individual ARM loans. The coupon rate resets periodically to a new level that depends on the underlying index, plus a fixed margin, subject to periodic and lifetime caps and floors that specify the maximum and minimum amounts by which the coupon can change on each adjustment date and over the life of the loan. Accordingly, the ARM coupon rate at time $t, C(t)$, was computed as follows:

$$C(t) = max\{min[\,Index(t-S) + Margin,\\ C(t-1) + A(t)\cdot Period\_UpCap,\, C(0) + Life\_UpCap],\\ C(t-1) - A(t)\cdot Period\_DownCap(t),\, max(C(0) - Life\_DownCap, Life\_Min)\} \quad (11)$$

where $Index(t)$ is the underlying rate index value at time t, S is the "look back" period, and *Margin* is the amount added to $Index(t-S)$ to obtain the "fully-indexed" coupon rate. The periodic adjustment caps are given by $Period\_UpCap$ and $Period\_DownCap$, and are multiplied by dummy variable $A(t)$ which equals zero except during scheduled adjustment periods. Maximum lifetime adjustments are determined by $Life\_UpCap$ and *Life_DownCap*, and $Life\_Min$ is the overall minimum lifetime rate level. Any initial discounts in ARM coupon rates are reflected in the original interest rate represented by *C(0)* in equation (11).

Yield Curve Slope

Expectations about future interest rates and differences in short-term and long-term borrowing rates associated with the slope of the Treasury yield curve influence the choice between ARM and FRM loans and the timing of refinancing. We use the spread of the ten-year Constant Maturity Treasury (CMT) yield over the one-year CMT yield to measure the slope of the Treasury yield curve.

Burnout Factor

A burnout factor is included to identify borrowers who have foregone recent opportunities to refinance. The burnout factor is included to account for individual differences in propensity to prepay, often characterized as unobserved heterogeneity. In addition, unobservable differences in borrower equity at the loan level may give rise to heterogeneity that can impact both prepayment and claim rates. Borrowers in a negative equity position are less likely to prepay due to the difficulty of qualifying for a new loan and are more likely to exercise the default option.

Empirical evidence now suggests that borrowers who refinance tend to do so at much lower thresholds and the ones that don't tend to be slow to prepay even when it is financially advantageous. The burnout factor is quantified as the cumulative number of quarters the borrower was "in the money," with the current mortgage rate less than the contract rate.

Exposure Year/Quarter FRM Rate

A variable measuring the market average FRM mortgage rate is included to distinguish high-rate and low-rate market environments. This variable was entered as a continuous quadratic function.

Source of Downpayment Assistance

As documented in the FY 2006 and FY 2007 Reviews, the FHA single-family program experienced a significant increase in the use of downpayment assistance from relatives, non-profit organizations, and government programs. An omitted category does not apply here, because not all borrowers use downpayment assistance. Following the approach first applied in the FY 2006 Review, we have included a series of indicators to control for the use of different types of downpayment assistance by FHA borrowers. Loans to borrowers utilizing downpayment assistance from non-profit organizations have been observed to generate significantly higher claim rates. Although this particular form of downpayment assistance is now prohibited, it is still necessary to control for their impact on historical and future loan performance for those loans that received such assistance.

Borrower Credit Scores

Borrower credit scores at the loan level were first included in the models estimated for the FY 2007 Review and continue to be an important predictor of claim and prepayment behavior. FHA has relatively complete data on borrower FICO scores for loans originated since May 2004. In addition, FHA retroactively obtained borrower credit history information for selected samples of FHA loan applications submitted as far back as FY 1992. These data provide an additional source of loan-level information on borrower FICO scores that are used for estimation. Historical FICO score data was collected for HUD by Unicon Corporation for FHA applications submitted during FY 1992, FY 1994, and FY 1996. FICO scores of the primary borrower and up to two co-applicants were collected from a single credit data repository for a random sample of approximately 20 percent of loan applications. Since the estimation dataset for the transition equations starts in FY1996, only the latter sample is relevant here.

A second set of sample data was collected for loan applications over the period from FY1997 to FY 2001. FICO scores for up to three co-applicants were collected from up to two credit data repositories for about 20 percent of the loans in each year, with over-sampling of loans defaulted by April 2003. A third and final set of data, similar to the second set, was collected for FY 2002 to FY 2005 applications, with over-sampling of loans defaulted by February 2005. The over-sampling of historical borrower credit scores for default outcomes introduces issues of choice-based sampling. These issues are addressed in a separate section below.

These three sets of FICO data represent the most reliable sources of borrower credit history information available for historical FHA-endorsed loans prior to FY 2005. Following the methodology adopted by Freddie Mac and Fannie Mae, the FICO score of each individual borrower or co-borrower, respectively, is the median (of three) or minimum (of two) scores when scores are provided by multiple credit data repositories. The final FICO score assigned to a loan is the simple average of these individual FICO scores for the borrower and up to four co-borrowers.

Additional indicator variables were specified to represent two particular forms of missing data on FICO scores. The categorical outcome 000 was defined corresponding to loans in the Unicon sample known to have been submitted for scoring to one more credit data repository, but for which the borrower credit history was insufficient to generate a FICO score. The categorical outcome 999 was defined corresponding to loans originated prior to FY 2005 for which no attempt was made to obtain a FICO score, due either to exclusion from the Unicon sample or because they were originated prior to the availability of FHA FICO scores.

Through the process of linking streamline refinance loans to the original fully underwritten FHA mortgages to the same borrowers, we developed a parallel set of FICO score indicators for streamline refinance loans and included these as explanatory variables when estimating the transition probability models for these products.

Finally, an indicator was defined to distinguish loans with FICO scores obtained through the normal FHA loan approval process from loans for which FICO scores were obtained from the retrospective historical sampling procedure conducted by Unicon Corporation. This variable was included to control for the potential effect of choice-based sampling due to the oversampling of defaulted loans in the Unicon project.

Choice-Based Sampling of Historical FICO Scores and Random Sampling of FHA Loans

As described in Section I of this Appendix, random samples of less than 100-percent of the available data were used for the estimation of the loan status transition models for some loan products. In prior years Reviews, a stratified random sampling scheme was applied to assure adequate representation of loans with historical FICO score data. For the FY2012 review we have elected to utilize simple random sampling for those products utilizing less than 100 percent samples. The number of years of relatively complete credit score data from FHA now includes FY2004 to FY2012, and since estimation is now based on data for loans endorsed during FY1996 to FY2012, a greater reliance is placed on FHA's own credit score information. In recognition of the potential impact of choice-based sampling of the Unicon-supplied credit scores, we continue to include the indicator of whether the loan was included in the Unicon loan subsample.

Variables for Streamline Refinance Mortgages

The FY2012 Review follows the same logic used in the FY2011 Review that linked streamlined refinance mortgages to their original fully underwritten FHA loans previously issued to the same borrower. Many FHA borrowers receive multiple streamline refinances over time, so the process of linking any given streamline refinance mortgage with its original ancestor loan sometimes requires establishing prior linkages through a sequence of FHA loans. We were able to identify the original fully underwritten FHA mortgage for about 98 percent of all streamline refinance mortgages originated and endorsed for FHA insurance since FY 1990.

For the streamline refinance mortgages that didn't trace back to original fully underwritten FHA mortgage, we imputed their loan attributes of original fully underwritten FHA mortgage with median values of ones that do trace back to original fully underwritten FHA mortgage.

The main benefit of linking streamline refinance mortgages with their original fully underwritten loans is that it enables us to improve the estimation of the current LTVs and probabilities of negative equity for the subsequent streamline refinance mortgages. The process of updating current LTVs and PNEQ values begins at loan origination and proceeds period-by-period over the life of the loan. In the case of the streamline refinance mortgage, we obtained the original LTV and property values and updated them from that point forward, as if the current streamline refinance was a continuation of the original mortgage (for this purpose only, not for amortization and other dynamic processes specific to the current loan). We only apply this process to streamline refinance mortgages without required appraisals. In those cases where appraisals were required, we used the information from the appraisals to compute the current LTVs and PNEQ for the streamline mortgage.

We were also able to assign indicators of original LTV, relative loan size, and downpayment assistance type to current streamline mortgages based on the original fully underwritten mortgage and to include these variables in the models for streamline refinance mortgage products.

Finally, we developed indicators of the loan product type of the prior mortgages to include as an additional explanatory variable in the status transition models for streamline refinance loans. The baseline category is 30-year fixed-rate mortgages.

III. Logistic Model Estimation Results

Exhibit A-3 (parts A-3.1 to A-3.6) present the coefficient estimates for the binomial logistic models for all of the product and transition type combinations of the model. We included the explanatory variable descriptions and value definitions directly alongside the parameter estimates to facilitate comparison of the models.

Exhibit A-3.1. Product 1 (FRM30) Binomial Logit Model Coefficient Estimates

Variable			Status Transition (from_to)																	
Description	**Name**	**Values**	**current_ currentX**		**current_ default**		**current_ prepay**		**current_SR**		**default_ prepay**		**default_ claim**		**default_ cure_m**		**default_ cure_s**	
Mortgage age function	**age1**	Spline function knot values shown next to the corresponding coefficient estimates	2	1.7320	2	1.3868	4	0.6478	2	0.9409	8	-0.101	8	0.1811	6	0.21582	8	0.03011
	age2		10	0.0693	5	0.1682	10	0.0245	5	-0.0317	>8	-0.065	>8	0.0299	>6	0.00274	>8	0.0025
	age3		>10	-0.0404	>5	-0.0158	>10	-0.0482	10	-0.1427								
	age4								>10	-0.0762								
Burnout factor. Prior culmulative number of quarters prepayment option in the money	**burnout**	linear function	0.0159				-0.0101											
	burnout1	Spline function			9	0.0218												
	burnout2				>9	-0.0001												
Credit burnout factor. Prior culmulative number of quarters default option under water	**c_burnout1**	Spline function			6	-0.0267												
	c_burnout2				>6	-0.1183												
Credit Score	**credit_score**	linear function									0.0016				-0.0026		0.0003	
	credit_score1	Spline function	660	-0.0077	600	-0.0029	660	0.0023	660	0.0008			660	0.00234				
	credit_score2		>660	-0.0200	660	-0.0109	>660	0.0030	>660	0.0019			>660	0.00334				
	credit_score3				>660	-0.0135												
Missing credit score	**credit_score_000**	X=0/1	-0.2692		-0.1182		-0.0222		-0.2072		0.0480		0.3316		-0.3126		-0.0958	
No credit score returned	**credit_score_999**	X=0/1	-0.4516		-0.6562		0.2303		0.1773		0.2267		-0.6222		0.0910		0.1711	
Unemployment rate change in last two quarters	**delta_ue**	linear function							0.3289									
	delta_ue1	Spline function			0.0521													
	delta_ue2				0.2004													
Downpayment assistant types	**dpa_govt**	X=0/1	0.1918		0.1846		-0.0633		-0.3951		0.0178		0.0065		-0.0821		-0.0826	
	dpa_nonprof	X=0/1	0.3499		0.3796		-0.1459		0.2347		-0.2989		0.2543		0.1997		-0.2141	
	dpa_relative	X=0/1	0.1856		0.0994		0.0356		-0.0852									
Default duration function for judicial foreclosure state	**judicial_01**	X=1									-0.1910		-0.1095		-0.1291		-0.0887	
	dur_dum_2_judici	X=2									-0.3824		-1.4019		0.4027		-0.4709	
	dur_dum_3_judici	X=3									-0.4938		-0.2571		0.4370		-0.8978	
	dur_dum_4_judici	X>=4									-0.7652		0.4826		0.0433		-1.3873	
Default duration function for non-judicial foreclosure state	**dur_dum_2_non_ju**	X=2									-0.1108		0.1679		0.5948		-0.3188	
	dur_dum_3_non_ju	X=3									-0.3424		0.5340		0.5986		-0.7169	
	dur_dum_4_non_ju	X>=4									-0.6274		0.3677		0.1509		-1.1771	
FHA credit score indicator	**fha_score**	X=0/1			-0.2346		0.0599		0.0488				-0.7575		0.2372		0.0636	
House price appreciation local level	**hpa2y**	linear function	0.0111															
	hpa2y_n	Spline function			0	-0.0116												
	hpa2y_n				>0			0.0324		0.0443								
House price appreciation national level	**hpa2y_usa**	linear function									0.0334				-0.0244		0.0126	
Number of living units	**liv_units_1**	X=1																
	liv_units_2	X=2					-0.1036		-0.4024		0.2038				-0.3652			
	liv_units_34	X>=3	-0.2980		0.0261		-0.1364		-0.3542		0.1191				-0.9474			
Relative loan size	**loansize**	linear function				0.0008							-0.0031				-0.0009	
	loansize1	Spline function					100	0.0113	100	0.0289	120	0.008			120	0.00453		
	loansize2						180	0.0055	140	0.0090	>120	0			>120	0		
	loansize3						>180	0.0009	>140	0.0025								
LTV	**ltv100**	X>95				0.0167		0.4234		0.2755	0.6016		0.0643		-0.0527		-0.0040	
	ltv95	90<X<=95				0.1044		0.2746		0.3059	0.3976		0.0607		-0.0069		-0.0166	
	ltv90	X<=90																
Current LTV	**ltv_current**	linear function					-4.3895								-0.9001		-1.5898	
	ltv_current1	Spline function			1.0	1.3523					0.6	-6.738	0.6	8.6214				
	ltv_current2				1.2	2.4976					>0.6	-10.92	1.0	3.5051				
	ltv_current3				1.4	2.3532							>1.0	0				
	ltv_current4				>1.4	0.0000												
Spread of mortgage rate to 10-year CMT rate	**mspread**	linear function					0.2930		0.8445				-0.4082		-1.0283			
Probability of negative equity	**pneg**	linear function					-1.7188											
Prior default episode	**prior_default**	X=0/1			1.8747		-0.4799		-1.0643		-0.2043		-0.2482		0.2034		-0.0034	
Front-end ratio	**ratio_tmp_tei**	linear function	0.0105						0.0144								-0.0082	
	ratio_tmp_tei1	Spline function			28	0.0290	28	-0.0113										
	ratio_tmp_tei2				>28	0.0078	>28	0.0013										
Missing front-end ratio	**dti000**	X=0/1	-0.0624		-0.0441		0.0237		-0.1447								-0.04326642	
Refinance loan	**refinance**	X=0/1							0.3046									
Relative unemployment rate	**rel_ue_p1**	Spline function			1				1									
	rel_ue_p2				>1	0.0012			>1	0.2422								
Mortgage premium. Difference between coupon rate and average FRM market rate, divided by coupon rate	**relspread1**	Spline function			7.5	0.0098	0.0	0.0092	0.0	-0.0124					35	-0.0271	0	-0.0023
	relspread2				>7.5	-0.0013	7.5	0.0426	7.5	0.2442					>35	0	>0	-0.0094
	relspread3						20.0	0.0479	20.0	0.1587								
	relspread4						>20	0.0147	>20	0.0393								
Mortgage rate spread at origination. Difference between the mortgage note rate and the prevailing mortgage rate	**sato1**	linear function	0.2746												0.4638			
	sato11	Spline function			0	-0.0883												
	sato12				>0	0.4527												
Season of year	**season_winter**	X=0/1																
	season_spring	X=0/1	-0.7097		-0.0997		0.2497		0.0407		0.1705		0.0344		0.1134		-0.1622	
	season_summer	X=0/1	-0.6232		0.1641		0.1724		-0.2015		0.2602		0.1191		0.2500		-0.2535	
	season_fall	X=0/1	-0.4919		0.1724		0.1621		-0.0738		-0.0012		0.0415		-1.3890		0.2209	
Cross-section house price volatility	**sigma_parm_a**				0.0011		-0.0082											
Yield curve slope measured as difference of 10 year CMT to 1 year CMT rates	**ycslope**	linear function			0.0900		0.1041		0.0898				-0.4243				-0.1124	
Intercept term	**constant**	1	-5.3110		-7.6148		-6.3539		-14.4411		0.9705		-8.8847		-0.5982		-0.3256	
Estimation Sample Count	**N**	Total																
Gini Coefficient			0.300		0.587		0.578		0.729		0.604		0.433		0.416		0.358	
Log Likelihood (model)	**L1**		541,307		4,480,451		6,049,447		3,075,375		197,119		452,008		235,257		505,830	
Log Likelihood (constant)	**L0**		569,214		5,120,961		6,885,832		3,794,373		230,071		491,254		252,291		535,727	
Degrees of Freedom	**d.f.**	L1 - L0 parameters	19		40		36		35		26		27		29		29	
Chi-Squared Statistic	**Chi-square**	- 2*(L0-L1)	27,907		640,510		836,385		718,998		32,952		39,246		17035		29896	

Exhibit A-3.2. Product 2 (FRM15) Binomial Logit Model Coefficient Estimates

Variable			Status Transition (from_to)																	
Description	Name	Values	current_ currentX		current_ default		current_ prepay		current_SR		default_ prepay		default_ claim		default_ cure_m		default_ cure_s	
Mortgage age function	age1	Spline function knot values shown next to the corresponding coefficient estimates	2	1.9221	2	1.3743	4	0.4911	2	1.0945	8	0.0417	8	0.2109	6	0.1536	8	-0.0003
	age2		10	0.0724	6	0.1627	10	0.0425	5	0.0073	20	-0.0666	>8	0.0234	>6	-0.0111	>8	-0.0118
	age3		>10	-0.0249	12	-0.0294	20	-0.0686	10	-0.1921	>20	-0.0602						
	age4				>12	0.0051	>20	-0.0085	>10	-0.1137								
Credit burnout factor	c_burnout1	Spline function			6	-0.0542												
	c_burnout2				>6	-0.1445												
Credit Score	credit_score	linear function	-0.0119		-0.0103		0.0011		0.0015		0.0021		0.0017		-0.0016		0.0008	
Missing credit score	credit_score_000	X=0/1	-0.6695		-0.4275		0.0007		-0.3765		0.2141		0.0419		-0.8315		0.1346	
No credit score indicator	credit_score_999	X=0/1	-0.5520		-0.5215		0.1691		0.2817		0.2970		-0.5201		0.0169		0.0976	
Unemployment rate change in last two quarters	delta_ue	linear function			0.2231				0.2697									
Downpayment assistance type	dpa_govt	X=0/1	0.2543		0.4613		-0.0558		0.0559		-1.0430		0.0108		0.2662		0.0081	
	dpa_nonprof	X=0/1	0.7781		0.7048		-0.3594		1.0066		-0.4011		0.2859		-0.0158		-0.3660	
	dpa_relative	X=0/1	0.5146		0.2574		-0.0084		0.0292									
Default duration function for judicial foreclosure state	judicial_01	X=0/1									-0.2999		-0.2625		-0.2649		-0.1350	
	dur_dum_2_judici	X=0/1									-0.4269		-1.6913		0.3001		-0.5280	
	dur_dum_3_judici	X=0/1									-0.6825		-0.6086		0.4116		-1.0262	
	dur_dum_4_judici	X=0/1									-0.8784		0.4985		-0.0092		-1.2441	
Default duration function for non-judicial foreclosure state	dur_dum_2_non_ju	X=0/1									-0.1300		0.3093		0.6093		-0.2790	
	dur_dum_3_non_ju	X=0/1									-0.5232		0.5394		0.6394		-0.5877	
	dur_dum_4_non_ju	X=0/1									-0.7682		0.4756		0.2320		-0.9663	
FHA credit score indicator	fha_score	X=0/1			-0.0612		0.1409		1.5737				-0.5305		0.1451		0.0172	
House price appreciation local level	hpa2y	linear function	0.0093															
	hpa2y_n	Spline function			0	-0.0080												
	hpa2y_n				>0													
House price appreciation national level	hpa2y_usa	linear function					0.0274		0.0807		0.0369				-0.0205		0.0136	
Number of living units	liv_units_1	X=1																
	liv_units_2	X=2					-0.1011		-0.2818		0.2541				0.1518			
	liv_units_34	X>=3					-0.1450		-0.4500		0.1881				-0.2577			
Relative loan size	loansize	linear function			-0.0006		0.0049				0.0037		-0.0041		0.0032		-0.0002	
	loansize1	Spline function							100	0.0312								
	loansize2								140	0.0150								
	loansize3								>140	0.0048								
LTV	ltv100	X>95			0.1791		0.2496		0.3389		0.4758		0.4364		0.2227		0.1356	
	ltv95	90<X<=95			0.1693		0.2179		0.3291		0.2887		0.2573		0.1572		-0.0536	
	ltv90	X<=90																
Current LTV	ltv_current	linear function									-6.0160				-1.1949		-2.0808	
	ltv_current1	Spline function			1.0	1.7579	0.6	-1.7449					1.2	3.5851				
	ltv_current2				1.2	2.8390	0.9	-3.0373					>1.2	0.0000				
	ltv_current3				>1.2	0.0000	>0.9	-4.6747										
Spread of mortgage rate to 10-year CMT rate	mspread	linear function					0.3891		0.9651				-0.3788		-0.6792			
Probability of negative equity	pneq	linear function					-0.4500											
Prior default episode	prior_default	X=0/1			2.1520		-0.3358		-1.1673		-0.1439		-0.1670		0.1193		-0.0395	
Front-end ratio	ratio_tmp_tei	linear function	0.0121		0.0202		-0.0017		0.0211								-0.0084	
Missing front-end ratio	dti000	X=0/1	-0.4187		-0.1468		-0.1206		-0.5891								0.0874	
Refinance loan	refinance	X=0/1								0.4888								
Relative unemployment rate	rel_ue_p	spline function			1				1									
	rel_ue_p				>1	0.0163			>1	0.3475								
Mortgage premium	relspread	linear function			0.0010		0.0170		0.0811						-0.0303		-0.0041	
Mortgage rate spread at origination	sato1	linear function	0.4745		0.3887										0.5031			
Season of year	season_fall	X=0/1	-0.4143		0.0933		0.2281		0.0263		-0.0787		0.0149		-1.0252		0.1769	
	season_winter	X=0/1																
	season_spring	X=0/1	-0.6603		-0.0979		0.1749		0.0712		0.0184		0.0780		0.2281		-0.1365	
	season_summer	X=0/1	-0.5119		0.1132		0.1152		-0.3854		0.0879		0.0336		0.3157		-0.2131	
Cross-section house price volatility	sigma_parm_a	linear function					-0.0120											
Yield curve slope	ycslope	linear function			0.0741		0.0820		0.1889				-0.4725				-0.1261	
Intercept term	constant	1	-3.6657		-3.7083		-6.4492		-15.6490		-1.1987		-5.7078		-1.2288		-0.0671	
Estimation Sample Count	N	Total																
Gini Coefficient			0.195		0.674		0.439		0.742		0.490		0.474		0.408		0.356	
Log Likelihood (model)	L1		46,974		322,941		978,043		263,498		11,561		18,251		12,788		31,688	
Log Likelihood (constant)	L0		50,270		386,076		1,048,818		323,563		12,755		20,182		13,704		33,642	
Degrees of Freedom	d.f.	L1 - L0 parameters	16		30		31		31		26		25		29		28	
Chi-Squared Statistic	Chi-square	- 2*(L0-L1)	3,295		63,135		70,774		60,066		1,193		1,932		916		1954	

Exhibit A-3.3. Product 3 (ARM) Binomial Logit Model Coefficient Estimates

Variable			Status Transition (from_to)															
Description	**Name**	**Values**	**current_ currentX**		**current_ default**		**current_ prepay**		**current_SR**		**default_ prepay**		**default_ claim**		**default_ cure_m**		**default_ cure_s**	
Mortgage age function	age	linear function									-0.0584				0.0036		-0.0038	
	age1	Spline function knot	2	1.7702	2	1.3168	4	0.6454	2	1.1772			4	0.3806				
	age2	values shown next to	6	0.1530	6	0.1655	10	0.0384	5	0.2845			12	0.0852				
	age3	the corresponding	12	0.0445	20	0.0041	20	-0.0691	10	-0.1106			>12	0.0362				
	age4	coefficient estimates	>12	-0.0209	>20	-0.0087	>20	-0.0617	>10	-0.1435								
Credit burnout factor	c_burnout1	Spline function			6	0.0069												
	c_burnout2				>6	-0.1714												
Credit score	credit_score	linear function	-0.0101		-0.0071		0.0029		0.0012		0.0016		0.0025		-0.0024			
Missing credit score	credit_score_000	X=0/1	-0.2160		0.0257		0.0696		-0.0323		-0.0388		0.3808		-0.2263			
No credit score indicator	credit_score_999	X=0/1	-0.5748		-0.7152		0.2479		0.1891		0.1856		-0.6811		0.0518			
Unemployment rate change in last two quarters	delta_ue	linear function			0.1043				0.0182									
Downpayment assistance type	dpa_govt	X=0/1	0.3328		0.2376		-0.2482		-0.0884		-0.2045		0.2163		0.0122		-0.0670	
	dpa_nonprof	X=0/1	0.3056		0.3036		-0.2304		0.0036		-0.1496		0.2313		0.2894		-0.2199	
	dpa_relative	X=0/1	0.1635		0.1292		-0.0290		-0.1608									
Default duration function for judicial foreclosure state	judicial_01	X=0/1									-0.1772		0.1015		-0.0251		-0.1314	
	dur_dum_2_judici	X=0/1									-0.3436		-1.5062		0.5367		-0.5191	
	dur_dum_3_judici	X=0/1									-0.4311		-0.5594		0.5500		-0.8590	
	dur_dum_4_judici	X=0/1									-0.7200		0.4426		0.0567		-1.6052	
Default duration function for non-judicial foreclosure state	dur_dum_2_non_ju	X=0/1									0.0026		-0.3123		0.6006		-0.3378	
	dur_dum_3_non_ju	X=0/1									-0.2721		0.4382		0.6448		-0.8068	
	dur_dum_4_non_ju	X=0/1									-0.6687		0.3616		0.1300		-1.3329	
Current mortgage rate level	ey_rate	linear function			0.1536		-0.2869		-0.3049									
FHA credit score indicator	fha_score	X=0/1			-0.2299		0.1170		-0.4835				-0.5763		-0.1405			
House price appreciation local level	hpa2y	linear function	0.0100															
	hpa2y_n	Spline function			0	-0.0156												
	hpa2y_n				>0													
House price appreciation	hpa2y_usa	linear function					0.0294				0.0367				-0.0391		0.0155	
Number of living units	liv_units_1	X=1																
	liv_units_2	X=2					-0.1397		-0.3940		-0.0382				-0.3835			
	liv_units_34	X>=3			0.4042		-0.3551		-0.4494		-0.1811				-0.9608			
Relative loan size	loansize	linear function			-0.0013		0.0058		0.0092		0.0041		-0.0032		0.0037		-0.0007	
LTV	ltv100	X>95			0.0915		0.2581		0.3174		0.3710		-0.0113		-0.0552		-0.0044	
	ltv95	90<X<=95			0.0884		0.1620		0.2378		0.2817		0.0368		-0.0513		0.0057	
	ltv90	X<=90																
Current LTV	ltv_current	linear function					-3.8367								-1.2325		-1.6940	
	ltv_current1	Spline function			1.0	1.7749					0.6	-6.6524	0.8	6.1420				
	ltv_current2				1.4	2.0695					>0.6	-10.2473	1.0	1.2711				
	ltv_current3				>1.4	0.9847							>1	0.0000				
Spread of mortgage rate to	mspread	linear function			0.1499		0.2508		0.6398				-0.3248		-0.8826			
ARM payment shock	pmt_shock1	Spline function					0	0.0010	0	-0.0311	0	0.0073			0	0.0438	0	0.0054
	pmt_shock2						>0	0.0110	>0	-0.0058	>0	0.0085			>0	0.0253	>0	0.0000
Probability of negative equity	pneq	linear function					-2.7323											
Prior default episode	prior_default	X=0/1			1.9978		-0.4313		-0.8666		-0.1733		-0.2691		0.2462		-0.0286	
Front-end ratio	ratio_tmp_tei	linear function	0.0090		0.0170		-0.0050		0.0149								-0.0078	
Missing front-end ratio	dti000	X=0/1	-0.0038		0.0734		-0.0776		-0.0293								0.0457	
Refinance loan	refinance	X=0/1							0.0896									
Relative unemployment rate	rel_ue_p1	spline function			1													
	rel_ue_p2				>1	0.0587												
Mortgage premium	relspread	linear function					0.0126		0.0597						-0.0274			
Spread at origination.	sato1	linear function	0.2205		0.1935										0.3235			
Season of year	season_fall	X=0/1	-0.4460		0.1625		0.0857		-0.1391		0.0415		0.0294		-1.4780		0.4061	
	season_winter	X=0/1																
	season_spring	X=0/1	-0.5703		-0.1274		0.2591		0.0620		0.2380		0.0669		0.1060		-0.0586	
	season_summer	X=0/1	-0.4868		0.0778		0.1438		-0.1848		0.3268		0.0540		0.2277		-0.1042	
Cross-Section house price	sigma_parm_a	linear function			0.0074		-0.0002											
Yield curve slope	ycslope	linear function			0.0718		0.0256		0.1128				-0.4194				-0.1168	
Intercept term	constant	1	-3.7237		-5.9327		-3.8073		-7.6784		0.9256		-8.4607		0.5564		0.1665	
Estimation Sample Count	N	Total																
Gini Coefficient			0.286		0.563		0.510		0.599		0.538		0.441		0.442		0.382	
Log Likelihood (model)	L1		251,200		1,866,619		3,513,495		1,852,446		101,273		184,258		87,078		217,988	
Log Likelihood (constant)	L0		261,558		2,122,269		3,909,112		2,109,504		114,183		201,620		94,024		232,818	
Degrees of Freedom	d.f.	L1 - L0 parameters	17		34		32		30		27		27		30		23	
Chi-Squared Statistic	Chi-square	- 2*(L0-L1)	10,359		255,650		395,617		257,058		12,910		17,362		6946		14830	

Exhibit A-3.4. Product 4 (FRM30 SR) Binomial Logit Model Coefficient Estimates

Variable			Status Transition (from_to)																	
Description	**Name**	**Values**	**current_ currentX**		**current_ default**		**current_ prepay**		**current_SR**		**default_ prepay**		**default_ claim**		**default_ cure_m**		**default_ cure_s**	
Mortgage age function	age	linear function									-0.0469						-0.0016	
	age1	Spline function knot	2	1.7436	2	1.3803	2	1.0974	2	0.9714			8	0.0786	6	0.2354		
	age2	values shown next to	6	0.1685	5	0.1681	6	0.1416	10	-0.1768			>8	0.0336	10	-0.0508		
	age3	the corresponding	>6	-0.0552	10	-0.0063	18	-0.0096	>10	-0.1053					>10	-0.0047		
	age4	coefficient estimates			>10	-0.0192	>18	-0.0466										
Loans with appraised value	appraisal_req	X=0/1	0.0469		-0.1339		0.0753		-0.4922		0.3877		-0.2436		-0.0686		0.0780	
Burnout factor	burnout	linear function	0.0285		0.0045		-0.0055											
Credit burnout factor	c_burnout1	Spline function			6	-0.0086												
	c_burnout2				>6	-0.1537												
Credit score	credit_score	linear function	-0.0094		-0.0065		0.0011		0.0010		0.0015		0.0035		-0.0030		-0.0005	
Missing credit score	credit_score_000	X=0/1	-0.1146		-0.0647		-0.5372		-0.5947		-0.3982		0.3493		0.0171		0.0974	
No credit score returned	credit_score_999	X=0/1	-0.4121		-0.3907		0.2164		0.2974		0.2138		-0.4967		0.0667		0.0798	
Unemployment rate change last two quarters	delta_ue	linear function			0.1488				0.2868									
Downpayment assistance type	dpa_govt	X=0/1	0.3054		0.2369		0.0172		0.0445		-0.1604		0.0677		0.1684		-0.1437	
	dpa_nonprof	X=0/1	0.3841		0.2760		0.0432		0.0987		-0.0732		0.1546		0.0737		-0.2205	
	dpa_relative	X=0/1	0.2698		0.1064		0.1701		-0.0572									
Default duration function for judicial foreclosure state	judicial_01	X=0/1									-0.1977		-0.0086		-0.0185		-0.0956	
	dur_dum_2_judici	X=0/1									-0.4067		-1.6341		0.4200		-0.4547	
	dur_dum_3_judici	X=0/1									-0.5167		-0.5038		0.3719		-0.7594	
	dur_dum_4_judici	X=0/1									-0.6754		0.5333		0.0839		-1.2223	
Default duration function for non-judicial foreclosure state	dur_dum_2_non_ju	X=0/1									-0.0792		0.0359		0.5693		-0.2903	
	dur_dum_3_non_ju	X=0/1									-0.3042		0.4614		0.5913		-0.6337	
	dur_dum_4_non_ju	X=0/1									-0.5443		0.3748		0.1975		-0.9907	
FHA credit score indicator	fha_score	X=0/1			-0.0256		0.4080		-0.1379				-0.7510		0.1080		-0.0376	
House price appreciation local level	hpa2y	linear function	0.0070															
	hpa2y_n	Spline function			0	-0.0166												
	hpa2y_n				>0													
House price appreciation national level	hpa2y_usa	linear function					0.0442		0.0384		0.0449				-0.0152		0.0126	
Number of living units	liv_units_1	X=1																
	liv_units_2	X=2					-0.1814		-0.5004						-0.3072			
	liv_units_34	X>=3					-0.2912		-0.7617						-0.7968			
Relative loan size	loansize	linear function			0.0016		0.0000		0.0142		0.0066		-0.0038		0.0025		-0.0008	
	loansize1	Spline function					120	0.0109										
	loansize2						>120	0.0032										
LTV	ltv100	X>95			0.0202		0.1986		0.2295		0.1821		0.0157		0.1105		-0.0231	
	ltv95	90<X<=95			0.0863		0.0250		0.1971		-0.0231		0.0443		0.0873		-0.0472	
	ltv90	X<=90																
Current LTV	ltv_current	linear function					-2.7535				-7.7726				-1.1822		-1.9200	
	ltv_current1	Spline function			1.2	1.6333							0.8	6.3610				
	ltv_current2				>1.2	0.9395							1.0	1.2202				
	ltv_current3												>1.0	0.0000				
Spread of mortgage rate to 10-year CMT rate	mspread	linear function					0.2939		1.2793				-0.4716		-0.7354			
Probability of negative equity	pneq	linear function					-2.9180											
Prior default episode	prior_default	X=0/1			1.9141		-0.3636		-1.0101		-0.1903		-0.2695		0.2267		0.0156	
Prior product type	prior_prod_2	X=0/1	0.1278		0.1180		0.0455		-0.2270		-0.2797		0.0710		0.0008		-0.1128	
	prior_prod_3	X=0/1	-0.3245		-0.0958		0.0706		0.0526		0.0568		0.0090		-0.2860		0.0014	
	prior_prod_4	X=0/1	0.0858		0.0970		0.1521		0.4485		-0.0131		0.0665		0.0184		-0.1699	
	prior_prod_5	X=0/1	-0.1343		0.0545		0.0831		0.3261		0.2640		-0.1146		-0.1955		-0.2028	
	prior_prod_6	X=0/1	0.0485		0.1848		0.1994		0.5697		-0.0926		0.1541		-0.1618		-0.1758	
Front-end ratio	ratio_tmp_tei	linear function	0.0037		0.0061		-0.0010		0.0073								-0.0019	
Missing front-end ratio	dti000	X=0/1	0.0414		0.1387		-0.0933		0.3082								-0.0165	
Relative unemployment rate	rel_ue_p	spline function			1				1									
	rel_ue_p				>1	0.2429			>1	0.2721								
Mortgage premium	relspread	linear function			0.0045		0.0253		0.1200						-0.0242		-0.0051	
Mortgage rate spread at origination	sato1	linear function	0.1020		0.1439										0.0938			
Season of year	season_fall	X=0/1	-0.4005		0.0871		0.1703		0.0026		0.0316		0.0835		-1.2435		0.2803	
	season_winter	X=0/1																
	season_spring	X=0/1	-0.6317		-0.1358		0.2534		-0.0088		0.2036		0.0225		0.2068		-0.1249	
	season_summer	X=0/1	-0.5767		0.1172		0.2136		-0.0488		0.2837		0.1262		0.2698		-0.1995	
Cross-section house price volatility	sigma_parm_a	linear function			0.0027		-0.0023											
Yield curve slope	ycslope	linear function			0.1041		0.0990		0.1622				-0.4289				-0.1163	
Intercept term.	constant	1	-4.356957613		-5.4962		-7.0264		-12.1632		0.7020		-7.3662		-0.4161		0.3079	
Estimation Sample Count	N	Total																
Gini Coefficient			0.243		0.560		0.550		0.725		0.595		0.463		0.394		0.324	
Log Likelihood (model)	L1		410,586		3,154,371		5,982,459		2,893,852		129,330		238,085		151,188		290,909	
Log Likelihood (constant)	L0		429,770		3,545,983		6,742,222		3,565,848		150,371		263,338		161,115		305,130	
Degrees of Freedom	d.f.	L1 - L0 parameters	23		38		37		33		28		32		36		33	
Chi-Squared Statistic	Chi-square	- 2*(L0-L1)	19,184		391,611		759,763		671,995		21,040		25,253		9927		14221	

Exhibit A-3.5. Product 5 (FRM15 SR) Binomial Logit Model Coefficient Estimates

Variable			Status Transition (from_to)							
Description	**Name**	**Values**	**current_ currentX**	**current_ default**	**current_ prepay**	**current_SR**	**default_ prepay**	**default_ claim**	**default_ cure_m**	**default_ cure_s**
Mortgage age function	age	linear function					-0.0143			-0.0153
	age1	Spline function knot values shown next to the coefficient estimates	6 0.2870	2 1.1383	2 1.0672	2 1.2235		6 0.3397	6 0.2594	
	age2		>6 -0.0275	6 0.1112	10 0.0945	5 -0.0620		>6 0.0550	>6 -0.0094	
	age3			20 -0.0084	20 -0.0325	10 -0.1280				
	age4			>20 -0.0262	>20 0.0117	>10 -0.1219				
Loans with appraised value	appraisal_req	X=0/1	0.0511	-0.0256	0.2163	-0.3210	0.3918	-0.3539	0.0803	0.1886
Credit burnout factor	c_burnout1	Spline function		6 0.0150						
	c_burnout2			>6 -0.2300						
Credit Score	credit_score	linear function	-0.0127	-0.0082	-0.0002	0.0017	0.0027	0.0047	-0.0039	-0.0002
Missing credit score	credit_score_000	X=0/1	-0.5252	-0.0750	-0.5210	-1.8870	-0.2064	0.4134	-0.1645	-0.0691
No credit score indicator	credit_score_999	X=0/1	-0.7108	-0.4036	0.0859	0.3169	0.1713	-0.0132	-0.0876	-0.0391
Unemployment rate change in last two quarters	delta_ue	X=0/1		0.1673		0.0435				
Downpayment assistance type	dpa_govt	X=0/1	-0.1152	0.2788	0.0725	0.6104	0.3422	0.5717	0.4388	-0.0205
	dpa_nonprof	X=0/1	0.1969	0.2719	0.2100	0.0017	0.6077	0.6608	0.3766	-0.4732
	dpa_relative	X=0/1	0.3928	0.2238	0.2727	0.0968				
Default duration function for judicial foreclosure state	judicial_01	X=0/1					-0.1545	0.1050	-0.0248	-0.1577
	dur_dum_2_judici	X=0/1					-0.3495	-1.3970	0.5001	-0.5157
	dur_dum_3_judici	X=0/1					-0.2661	-0.0690	0.7521	-0.8230
	dur_dum_4_judici	X=0/1					-0.7278	1.0640	0.2599	-1.2349
Default duration function for non-judicial foreclosure state	dur_dum_2_non_ju	X=0/1					-0.0467	0.3408	0.7049	-0.3021
	dur_dum_3_non_ju	X=0/1					-0.3760	0.4430	0.6067	-0.6433
	dur_dum_4_non_ju	X=0/1					-0.7890	0.5425	0.4325	-0.9989
FHA credit score returned	fha_score	X=0/1		-0.0457	0.3366	1.3121		-0.2594	0.3448	-0.1535
House price appreciation local level	hpa2y	linear function	0.0067							
	hpa2y_n	Spline function		0 -0.0062						
	hpa2y_n			>0						
House price appreciation national level	hpa2y_usa	linear function			0.0360	0.0554	0.0397		-0.0157	0.0142
Number of living units	liv_units_1	X=1								
	liv_units_2	X=2			-0.0864	-0.4358	-0.1483		0.3344	
	liv_units_34	X>=3			-0.3059	-0.7913	0.5835		-1.6432	
Relative loan size	loansize	linear function		0.0006	0.0044	0.0136	0.0048	-0.0074	0.0000	-0.0013
LTV	ltv100	X>95		0.0164	0.1427	0.1129	0.1615	0.2052	0.0793	-0.0035
	ltv95	90<X<=95		0.0985	0.0531	0.0337	-0.0345	0.2118	0.2525	-0.0920
	ltv90	X<=90								
Current LTV	ltv_current	linear function					-4.2046		-0.9012	-1.8952
	ltv_current1	Spline function		1.0 1.1995	0.8 -1.5539			0.8 6.7322		
	ltv_current2			1.1 3.8321	>0.8 -2.1688			>0.8 0.0000		
	ltv_current3			>1.1 0.0000						
Spread of mortgage rate to 10-year CMT rate	mspread	linear function			0.3650	1.4576		-0.0204	-1.0555	
Prior default episode	prior_default	X=0/1		2.7083	-0.2314	-0.0377	-0.4520	-0.2389	0.1022	0.0318
Prior product type	prior_prod_2	X=0/1	-0.0544	0.1510	0.4069	1.1137	0.4473	0.3260	-0.0678	-0.0789
	prior_prod_3	X=0/1	-0.3567	-0.0756	0.2282	0.2329	0.1846	0.2384	0.1442	-0.2432
	prior_prod_4	X=0/1	-0.5014	-0.2310	0.1471	0.6109	0.2992	0.0830	-0.0918	-0.0897
	prior_prod_5	X=0/1	0.3643	-0.0886	0.3230	0.6988	-0.0228	0.1226	-0.2274	-0.1303
	prior_prod_6	X=0/1	-1.1752	0.0732	0.3202	0.2265	-0.2069	0.8027	-10.5545	0.3916
Front-end ratio	ratio_tmp_tei	linear function	0.0105	0.0064	-0.0026	0.0061				-0.0018
Missing front-end-ratio	dti000	X=0/1	0.0825	0.2188	-0.1632	-0.3721				0.2035
Relative unemployment rate.	rel_ue_p	spline function		1		1				
	rel_ue_p			>1 0.4273		>1 0.4541				
Mortgage premium	relspread	linear function		0.0078	0.0137	0.1009			-0.0243	-0.0011
Season of year	season_fall	X=0/1	-0.2466	0.1618	0.0874	0.1714	-0.1028	-0.0184	-1.1376	0.1283
	season_winter	X=0/1								
	season_spring	X=0/1	-0.4565	-0.1263	0.1768	0.1259	0.1375	0.1055	0.1153	-0.1138
	season_summer	X=0/1	-0.4976	0.0470	0.1229	0.0729	0.1975	0.1012	0.3586	-0.0550
Cross-section house price volatility	sigma_parm_a	linear function			-0.0046					
Yield curve slope	ycslope	linear function		0.0478	0.0489	0.2981		-0.5108		-0.1375
Intercept term	constant	1	-0.7595	-4.3639	-6.8899	-14.7602	-2.8892	-10.6232	0.1274	0.4070
Estimation Sample Count	N	Total								
Gini Coefficient			0.069	0.565	0.350	0.742	0.385	0.544	0.426	0.326
Log Likelihood (model)	L1		42,439	227,230	1,027,847	111,395	10,176	7,103	9,510	25,740
Log Likelihood (constant)	L0		43,922	261,153	1,074,624	139,806	10,829	8,087	10,273	27,128
Degrees of Freedom	d.f.	L1 - L0 parameters	20	35	35	34	30	31	34	33
Chi-Squared Statistic	Chi-square	- 2*(L0-L1)	1,483	33,923	46,778	28,411	653	984	763	1387

Exhibit A-3.6. Product 6 (ARM SR) Binomial Logit Model Coefficient Estimates

Variable			Status Transition (from_to)																	
Description	Name	Values	current_ currentX		current_ default		current_ prepay		current_SR		default_ prepay		default_ claim		default_ cure_m		default_ cure_s	
Mortgage age function	age	linear function																-0.0084
	age1	Spline function knot values shown next to the corresponding coefficient estimates	2	1.9590	2	1.3615	6	0.2240	2	1.1686	6	-0.0022	8	0.1532	5	0.2418		
	age2		8	0.0610	6	0.1238	12	-0.0445	5	-0.0012	>6	-0.0587	>8	0.0365	>5	-0.0158		
	age3		>8	-0.0452	20	0.0111	>12	-0.0499	10	-0.1946								
	age4				>20	-0.0149			>10	-0.1131								
Loans with appraised value	appraisal_req	X=0/1	0.1278		0.0494		0.0004		-0.3513		0.1658		-0.3137				0.0442	
Credit burnout factor	c_burnout1	Spline function			6	-0.0106												
	c_burnout2				>6	-0.2039												
Credit Score	credit_score	linear function	-0.0090		-0.0055		0.0018		0.0003				0.0033		-0.0036			
Missing credit score	credit_score_000	X=0/1	-0.2748		-0.3068		-0.3327		0.0110				0.0710		-0.3558			
No credit score indicator	credit_score_999	X=0/1	-0.3474		-0.3320		0.1704		0.0827				-0.3337		0.1028			
Unemployment rate change in last two quarters	delta_ue	linear function			0.1209				0.0207									
Downpayment assistance type	dpa_govt	X=0/1	0.4449		0.2025		0.0970		0.1591		-0.0338		0.2108		0.2060		-0.1139	
	dpa_nonprof	X=0/1	0.2998		0.2959		0.0325		0.1093		-0.0736		0.1633		-0.1023		-0.0985	
	dpa_relative	X=0/1	0.2050		0.0918		0.1051		-0.1707									
Default duration function for judicial foreclosure state	judicial_01	X=0/1									-0.0488		0.0270		-0.1920		-0.0440	
	dur_dum_2_judici	X=0/1									-0.2276		-1.8431		0.3806		-0.5122	
	dur_dum_3_judici	X=0/1									-0.4431		-0.7422		0.4530		-0.8160	
	dur_dum_4_judici	X=0/1									-0.5034		0.3765		-0.0080		-1.3035	
Default duration function for non-judicial foreclosure state	dur_dum_2_non_ju	X=0/1									-0.0007		-0.4689		0.3522		-0.3061	
	dur_dum_3_non_ju	X=0/1									-0.2828		0.4606		0.4810		-0.7274	
	dur_dum_4_non_ju	X=0/1									-0.4846		0.4003		0.1952		-1.1164	
Current mortgage rate level	ey_rate	linear function			0.0997		-0.0977		-0.0306									
FHA credit score indicator	fha_score	X=0/1			0.1575		0.2764		-0.3951				-0.2742		0.4157			
House price appreciation local level	hpa2y	linear function	0.0065															
	hpa2y_n	Spline function			0	-0.0161												
	hpa2y_n				>0													
House price appreciation national level	hpa2y_usa	linear function					0.0318				0.0467				-0.0099		0.0131	
Number of living units	liv_units_1	X=1																
	liv_units_2	X=2					-0.1298		-0.1117		0.2991				-0.0634			
	liv_units_34	X>=3			0.1593		-0.4322		-0.0916		-0.4291				-0.2715			
Relative loan size	loansize	linear function			0.0008		0.0083				0.0066		-0.0015		0.0030			
	loansize1	Spline function							120	0.0153								
	loansize2								>120	0.0024								
LTV	ltv100	X>95			0.0706		0.1134		0.2212		0.0876		-0.1114		0.0802		0.0179	
	ltv95	90<X<=95			0.0645		-0.0092		0.1860		0.1649		-0.0447		-0.0596		0.0001	
	ltv90	X<=90																
Current LTV	ltv_current	linear function					-3.1821				-9.2688				-1.5986		-2.4617	
	ltv_current1	Spline function			1.0	2.3746							0.9	5.5842				
	ltv_current2				1.2	2.6593							>0.9	0.0000				
	ltv_current3				>1.2	0.4662												
Spread of mortgage rate to 10-year CMT rate	mspread	linear function				0.2232		0.0382		0.4556				-0.2701		-0.6756		
ARM payment shock	pmt_shock1	Spline function					0	-0.0065	0	-0.0621	0	0.0162			0	0.0560	0	0.0098
	pmt_shock2						>0	0.0096	>0	0.0007	>0	0.0158			>0	0.0225	>0	0.0000
Probability of negative equity	pneq	linear function					-3.2623											
Prior default episode	prior_default	X=0/1			1.6848		-0.3794		-0.6786		-0.2268		-0.1936		0.1529		-0.0299	
Prior product type	prior_prod_2	X=0/1	0.3850		-0.0269		-0.1329		-0.2684		0.5732		0.4056		0.0148		-0.6443	
	prior_prod_3	X=0/1	-0.2444		-0.1170		0.1542		0.3926		0.1215		-0.0556		-0.1581		0.0730	
	prior_prod_4	X=0/1	0.1637		0.1247		0.1302		0.5093		0.0163		0.1028		0.0704		0.0017	
	prior_prod_5	X=0/1	0.1285		-1.1242		0.0500		-0.0878		-10.2025		-0.0579		-10.0251		-0.3904	
	prior_prod_6	X=0/1	0.2491		0.1322		0.2346		0.7263		0.0350		-0.0055		-0.1989		-0.1064	
Front-end ratio	ratio_tmp_tei	linear function	0.0044		0.0042		-0.0026		0.0022								-0.0073	
Missing front-end ratio	dti000	X=0/1	0.2918		0.1772		-0.0945		0.2825								-0.0936	
Relative unemployment rate	rel_ue_p	spline function			1													
	rel_ue_p				>1	0.0842												
Mortgage premium	relspread	linear function					0.0077		0.0509						-0.0111			
Mortgage rate spread at origination	sato1	linear function	0.1339		0.0352										0.1382			
Season of year	season_fall	X=0/1	-0.2872		0.0713		0.1570		-0.1596		-0.0640		0.1421		-1.2750		0.3844	
	season_winter	X=0/1																
	season_spring	X=0/1	-0.5845		-0.1456		0.2763		-0.0576		0.1921		0.1358		0.2923		-0.0205	
	season_summer	X=0/1	-0.4599		0.0341		0.2585		-0.1288		0.2639		0.2225		0.3511		-0.1071	
Cross-section house price volatility	sigma_parm_a	linear function			0.0051		-0.0007											
Yield curve slope	ycslope	linear function			0.0673		-0.0131		0.1497				-0.5050				-0.1074	
Intercept term.	constant	1	-4.5004		-7.3135		-3.2830		-8.0513		2.6090		-7.7849		-0.0393		0.5235	
Estimation Sample Count	N	Total																
Gini Coefficient			0.350		0.547		0.488		0.566		0.616		0.484		0.398		0.340	
Log Likelihood (model)	L1		45,917		299,631		624,488		304,431		15,552		36,641		18,356		35,223	
Log Likelihood (constant)	L0		48,188		335,367		687,082		344,070		18,330		41,313		19,562		37,106	
Degrees of Freedom	d.f.	L1 - L0 parameters	22		40		37		36		30		31		36		28	
Chi-Squared Statistic	Chi-square	- 2*(L0-L1)	2,271		35,736		62,593		39,639		2,778		4,672		1206		1883	

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Appendix B

Cash Flow Analysis

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Appendix B: Cash Flow Analysis

I. Introduction

The calculation of the economic value of the Fund involves the estimation of the present value of future cash flows generated by the existing portfolio and future books of business. The analysis requires the projection of future prepayment and claim incidence and severity and cash flow items associated with each type of outcome. This appendix describes the components of these cash flows.

The evaluation of the Fund's economic value at a point in time (e.g., end-of-year FY2012) requires accounting for the value of net assets plus the expected present value of future net income. The latter comprises future revenue and expenses. Similarly, the evaluation of the Fund's economic value in future years (FY2013 through FY2019) requires estimating the Fund's initial net asset position, the insurance portfolio composition at the end of each year, and the present value of future net income from the corresponding year-end forward.

In order to analyze future changes in the Fund's economic value, our model incorporates projections of loan performance and information about the existing portfolio composition to project the Fund's various cash flow sources. The actuarial model uses projections from econometric models as discussed in Appendices A (transitions), E (loss rates) and F (future volume projections). We estimated econometric models for conditional claim and prepayment probabilities for individual loans depending on the loan type, origination year, age, interest rate, loan purpose, initial and current LTV ratio, credit score, refinancing incentive, relative loan size, probability of negative equity, loan term, burnout, and other characteristics. The models also used data on serious delinquency status and the default history. Using detailed loan-level characteristics, we estimated the prepayment and claim probabilities and then generated respective cash flows for individual loans (Appendix A).

We estimated loss severity rates based on an econometric model that captures important determinants, including loan characteristics, property location, borrower credit history and house price appreciation rates (Appendix E). This year for the first time, the loss rate model distinguishes between conveyances and pre foreclosure sales. We estimated future FHA mortgage volumes for purchase, refinance and streamline refinance mortgages that vary with alternative house price and interest rate paths (Appendix F).

Based on the mortgage termination rates projected by the econometric models, the major components of cash flows are projected into the future. Future interest income is included in the present value discounting process. The relevant cash flow components are itemized in Exhibit B-1.

Exhibit B-1: Cash Flow Components

Cash Flow Components	Cash Inflow	Cash Outflow
Upfront Premiums	√	
Annual Premiums	√	
Interest Income	√	
Net Claim Payments		√
Loss Mitigation Expenses		√
Refunded Upfront Premiums		√
Administrative Expenses[a]		√
Distributive Shares[b]		√

[a] The administrative expense was discontinued since the FY 2002 Actuarial Review according to the Federal credit reform requirement.
[b] The distributive share has been suspended since 1990. There is no indication that it would be resumed in the foreseeable future.

These components were projected for individual loans on a probabilistic basis and then aggregated according to the product type and origination year, and also policy year for reporting purposes. Below, we discuss the derivation of each of these cash flows.

II. Background Information

The following definitions and background information clarify our discussion of the cash flow components:

- **Insurance-in-Force (IIF):** the nominal value of the unamortized original mortgage loan balances of the surviving mortgages insured by FHA. This is distinct from the conventional notion of amortized insurance-in-force, which includes only the current outstanding balances on surviving loans.

- **Conditional Claim Rate (CCR):** the number of loans that become claims during a time period divided by the number of surviving loans-in-force at the beginning of that period.

- **Conditional Prepayment Rate (CPR):** the number of loans being completely prepaid during a time period divided by the number of surviving loans-in-force at the beginning of that period.

- **Policy Year:** references the number of fiscal years since origination. The year in which the mortgage is originated is assigned as fiscal policy year one, even though it may not be a complete year.

- **Termination Year:** the fiscal year in which a mortgage terminates through a claim, prepayment or other reasons.

- **Unpaid Principal Balance (UPB) Factor:** the principal balance outstanding at a given time divided by the original mortgage amount. The UPB factor is calculated based only on amortization, given the original maturity, the type of mortgage, and the mortgage contract rate. For FRMs, the UPB factor for each quarter in the future can be directly computed using the initial contract rate and the amortization term. For ARMs, the UPB factor changes at different rates depending on the interest rate of the particular loan, which is updated according to the contractual rate-adjustment rule. In our model, the contract interest rates of ARM loans are updated by using changes in the one-year Treasury rate as an approximation for changes in the underlying index, subject to limits implied by FHA annual and lifetime rate-adjustment caps.

III. Cash Flow Components

We now describe the different cash flow components.

A. Premiums

1. Premium Structure

The primary source of revenue to the Fund is insurance premiums. If the Fund's mortgage insurance is priced to meet the expected liabilities, the insurance premiums collected and interest earned on them will, on average, cover all costs associated with mortgage loans insured by the Fund. The insurance premium has been structured in different ways during different time periods. Details of the evolvement of the premium structure are shown in Exhibits B-2, B-3 and B-4, and are as follows:

- For loans originated prior to September 1, 1983, the mortgage premium was collected on

a monthly basis at an annualized rate of 0.50 percent of the outstanding principal balance for the period. To align this change with fiscal quarters, we assumed that this annual premium policy was in effect through September 30, 1983.

- Between September 1, 1983 and June 30, 1991, the mortgage premium was charged only upon loan origination and was based on a percentage of the original mortgage amount at the time of origination. This amount was 3.80 percent for 30-year mortgages and 2.40 percent for 15-year mortgages.

- Effective July 1, 1991, the National Affordable Housing Act specified a new premium structure. This structure specified an upfront premium of 3.80 percent for all product types except for 15-year non-streamline refinance loans (for which the upfront premium was set at 2.00 percent) and an annual renewal premium of 0.50 percent per year on the outstanding balance. The annual premium would cease at different policy years depending on the initial LTV of the loan.

- On October 1, 1992, the upfront premium for 30-year mortgages was reduced from 3.80 percent to 3.00 percent. The annual premium for 30-year mortgages was extended for a longer time period, while for 15-year mortgages, it was lowered to 0.25 percent for a shorter time period or completely waived if the initial LTV ratio was less than 90 percent.

- As of April 17, 1994, FHA lowered the upfront premium rate on 30-year mortgages from 3.00 percent to 2.25 percent. To align this change with fiscal quarters, we started applying this policy change on April 1, 1994.

- Starting from October 1, 1996, FHA lowered the upfront premium rate on 30-year mortgages for first-time homebuyers who receive homeowner counseling from 2.25 percent to 2.00 percent. This rate was further reduced to 1.75 percent for mortgages executed on or after September 22, 1997. This favorable treatment for borrowers with homeownership counseling was terminated shortly thereafter.

- Effective January 1, 2001, FHA lowered the upfront premium rate for all mortgages to 1.50 percent. The annual premium would stop as soon as the current LTV ratio of the

loan was below 78 percent according to the home price as of the loan origination date. The annual premium was required to be paid for a minimum of five years for 30-year mortgages.

- Effective October 1, 2008, FHA charged an upfront premium rate of 1.75 percent for purchase money mortgages and full-credit qualifying refinances; and 1.50 percent for all types of streamline refinance loans. A varying annual premium, remitted on a monthly basis, was charged based on the initial loan-to-value ratio and maturity of the mortgage.

- Effective April 1, 2010, FHA changed upfront premium to 2.25 percent for all mortgages executed after Apr 1, 2010.

- Effective October 4, 2010, FHA lowered the upfront premium of all mortgages to 1.0 percent. The annual premium for loans with 30-year terms was increased to 0.85 percent for LTV ratios up to 95 percent and to 0.90 percent for LTV ratios greater than 95 percent. For loans with 15-year terms, an annual premium of 0.25 percent was set for LTV ratios greater than 90 percent.

- Effective April 18, 2011, the annual premium for loans with 30-year terms was increased to 1.10 percent for LTV ratios up to 95 percent and to 1.15 percent for LTV ratios greater than 95 percent. For loans with 15-year terms, the annual premiums were increased to 0.25 percent for LTV ratios up to 90 percent and to 0.50 percent for LTV ratios greater than 90 percent.

- Effective April 9, 2012, FHA increased the upfront premium of all mortgages to 1.75 percent. The annual premium for loans with 30-years terms was increased to 1.20 percent for LTV ratios up to 95 percent, and to 1.25 percent for LTV ratios greater than 95 percent. For loans with 15-year terms, the annual premiums were increased to 0.35 percent for LTV ratios up to 90 percent, and to 0.60 percent for LTV ratios greater than 90 percent.

- Effective June 11, 2012, the annual premium for loans with 30-year terms and base loan amount above $625,500, was increased to 1.45 percent for LTV ratios up to 95 percent,

and to 1.50 percent for LTV ratios greater than 95 percent. For loans with 15-year terms, and base loan amount above $625,500, the annual premium was increased to 0.60 percent for LTV ratios up to 90 percent, and to 0.85 percent for LTV ratios greater than 90 percent.

- Effective June11, 2012, for all SF Forward Streamline Refinance which are refinancing existing FHA loans that were endorsed on or before May 31, 2009, the upfront premium will decrease to 0.01 percent of the base loan amount, and the annual premium will be 0.55 percent, regardless of the base loan amount

Exhibit B-2: Upfront Premium Rates for Fully Underwritten FHA Loans

Fiscal Year	30yr Loans, Fixed or Adjustable Rate (%)	15yr Loans, Fixed or Adjustable Rate (%)
9/1/83 to 6/30/91	3.8	2.4
7/1/91 to 9/30/92	3.8	2.00
10/1/92 to 4/16/94	3	2
4/17/94 to 9/30/96	2.25	2
10/1/96 to 9/21/97	2.25/2.00[a]	2
9/22/97 to 12/31/00	2.25/2.00/1.75[a]	2
1/1/01 to 9/30/08	1.5	1.5
10/1/08 to 4/4/10	1.75	1.75
4/5/10 to 10/3/10	2.25	2.25
10/4/10 and 4/8/12	1	1
4/9/12 and later	1.75	1.75

[a] For first-time homebuyers who received homeowner counseling.

Exhibit B-3: Annual Premium Rate for 15- and 30-Year Fully Underwritten Mortgages

Fiscal Year	30yr Loans, Fixed or Adjustable	15yr Loans, Fixed or Adjustable
Prior to 9/1/1983	0.5% for life of loan	0.5% for life of loan
9/1/83 to 6/30/91	None	None
7/1/91 to 9/30/92	varies by LTV category[a]	varies by LTV category[a]
10/1/92 to 12/31/00	varies by LTV category[b]	varies by LTV category[c]
1/1/01 to 9/30/08	0.5% until loan balance reaches 78% of original property value, minimum of 5 years	varies by LTV category[d]
10/1/08 to 10/3/10	0.50% if LTV≤ 95% 0.55% if LTV > 95% until loan balance reaches 78% of original property value	0% if LTV ≤ 90% 0.25% if LTV > 90% until loan balance reaches 78% of original property value
10/4/10 to 4/17/11	0.85% if LTV≤ 95% 0.90% if LTV > 95% until loan balance reaches 78% of original property value	0% if LTV≤ 90% 0.25% if LTV > 90% until loan balance reaches 78% of original property value
4/18/11 and 4/8/12	1.10% if LTV≤ 95% 1.15% if LTV > 95% until loan balance reaches 78% of original property value	0.25% if LTV≤ 90% 0.50% if LTV > 90% until loan balance reaches 78% of original property value
4/9/12 and 6/10/12	1.20% if LTV≤ 95% 1.25% if LTV > 95% until loan balance reaches 78% of original property value	0.35% if LTV≤ 90% 0.60% if LTV > 90% until loan balance reaches 78% of original property value
6/11/12 and later	1.20% if LTV≤ 95% & base loan amount ≤ $625,500 1.25% if LTV > 95% & base loan amount ≤ $625,500 1.45% if LTV≤ 95% & base loan amount > $625,500 1.50% if LTV > 95% & base loan amount > $625,500 until loan balance reaches 78% of original property value	0.35% if LTV≤ 90% & base loan amount ≤ $625,500 0.60% if LTV > 90% & base loan amount ≤ $625,500 0.6% if LTV≤ 90% & base loan amount >$625,500 0.85% if LTV > 90% & base loan amount > $625,500 until loan balance reaches 78% of original property value

LTV Range:	a	b	c	d
below 90%	0.5% for 5 yrs	0.5% for 7 yrs	0%	0%
Between 90%~95%	0.5% for 8 yrs	0.5% for 12 yrs	0.25% for 4 yrs	0.25% until LTV reaches 78%
above 95%	0.5% for 10 yrs	0.5% for 30 yrs	0.25% for 8 yrs	0.25% until LTV reaches 78%

Insurance premium rules for streamline refinance (SR) loans are summarized in Exhibit B-4.

Exhibit B-4: Premium Rates for Streamline Refinance Loans

Period of Origination	30-Year Mortgages		15-Year Mortgages	
	Upfront Premium	Annual Premium	Upfront Premium	Annual Premium
7/1/91 to 9/30/92	3.80%	0.5% for first 7 years	3.80%	0.5% for first 7 years
10/1/92 to 4/16/94	3.00%	0.5% for first 7 years	2.00%	None
4/17/94 to 12/31/00	2.25%	0.5% for first 7 years	2.00%	None
1/1/01 to 9/30/08	1.50%	0.5% until loan balance reaches 78% of original property value, minimum of 5 years	1.50%	0.25% if LTV > 90%[a] until loan balance reaches 78% of original property value
10/1/08 to 3/31/10	1.50%	0.50% if LTV≤95%, 0.55% if LTV > 95% until loan balance reaches 78% of original property value	1.50%	0.25% if LTV > 90%[a] until loan balance reaches 78% of original property value
4/1/10 to 10/3/10	2.25%	0.50% if LTV≤95%, 0.55% if LTV > 95% until loan balance reaches 78% of original property value	2.25%	0.25% if LTV > 90%[a] until loan balance reaches 78% of original property value
10/4/10 to 4/17/11	1.00%	0.85% if LTV≤95%, 0.90% if LTV>95% until loan balance reaches 78% of original property value	1.00%	0.25% if LTV > 90%[a] until loan balance reaches 78% of original property value
4/18/11 and 6/10/12	1.00%	1.10% if LTV≤ 95% & base loan amount ≤ $625,500 1.15% if LTV > 95% & base loan amount ≤ $625,500 1.35% if LTV > 95% & base loan amount > $625,500 1.40% if LTV > 95% & base loan amount > $625,500 until loan balance reaches 78% of original property value	1.00%	0.25% if LTV≤ 90% & base loan amount ≤ $625,500 0.50% if LTV > 90% & base loan amount ≤ $625,500 0.5% if LTV > 95% & base loan amount > $625,500 0.75% if LTV > 95% & base loan amount > $625,500 until loan balance reaches 78% of original property value
6/11/12 and later [b]	0.01%[b]	0.55%[b] until loan balance reaches 78% of original property value	0.01%[b]	0.55%[b] until loan balance reaches 78% of original property value

[a] 0% if original LTV is equal or below 90 percent.

[b]only apply to SF Forward Streamline Refinance transactions that are refinancing existing FHA loans that were endorsed before May 31,2009.

2. Upfront Premium

The upfront premium is assumed to be fully paid at the mortgage origination date and the amount is calculated as follows:

*Upfront Premium Payment = Origination Loan Amount * Upfront Insurance Premium Rate*

In practice, FHA offers a premium finance program to those qualified for mortgage insurance, so that borrowers do not have to pay the upfront premium at the beginning of the contract. Instead, the borrower can add it to the original loan balance, in essence paying the upfront premium at the same schedule as their principal balance. The annual premium is charged based on the unpaid principal balance excluding the financed upfront premium. Almost all borrowers finance their upfront premiums in this fashion. However, the LTV including refinanced upfront premiums cannot exceed 97.5 percent.

3. Quarterly Premium

The quarterly premium is calculated as follows:

Quarterly Premium =
*Amortized UPB (excluding any upfront premiums) * Annual Insurance Premium Rate / 4*

The premium is actually collected on a monthly basis. The above formula models the premium as being collected at the beginning of each quarter for purposes of our analysis. In addition, the termination rate will have impacts on future premium flows. That is, all potential future premium income would no longer be paid when the particular mortgage loan is prepaid or becomes a claim.

Although FHA is effectively insuring the financed upfront premiums, the quarterly premium is not assessed on the amount of the financed upfront premium.

B. Losses Associated with Claims

The Fund's largest expense component comes in the form of payments arising from claims. FHA pays the claim to the lender after a lender files a claim. In most cases, FHA takes possession of the foreclosed property and sells the property to partially recover the loss. This particular type of claim is called a conveyance.

Based on this practice, claim cash flows can be decomposed into two components:

- Cash outflow of the claim payment at the claim date including expenses incurred, and
- Cash inflow of any net proceeds received in selling the conveyed property at the property disposition date.

For tractability, we simplify this two-step cash flow into one lump-sum amount. We also separately estimate losses from pre-foreclosure sales, wherein the property is sold prior to the completion of a foreclosure and the property is not conveyed to HUD (see Appendix E). The claim loss payment estimated in our model at time *t* is

$$Claim\ Loss_t = Amortized\ Surviving\ UPB_t * Conditional\ Claim\ Rate_t * Loss\ Rate_t$$

The $Amortized\ Surviving\ UPB_t$ is the amount of the unpaid balance of the loan after amortization multiplied by the probability that the loan will survive until the beginning of time *t*. The probability of survival is derived by dynamically simulating the loan subject to the projected conditional claim and conditional prepayment rates over individual time periods up to *t*. The conditional claim rate is estimated from the multinomial mortgage termination model presented in Appendix A.

The loss rate is usually referred to as the loss given default (LGD) or "severity" in the banking industry. It measures the amount of principal not recovered divided by the unpaid principal balance at the time of default. The claim loss rate is predicted by our loss severity model, which was calibrated using loan-level data based on endorsements originated during FY 1975 through FY 2012 Q2 that terminated as claims during the period FY 1999 through FY 2012Q2.And we used different data periods to estimate different loss severity equations. For additional technical details, refer to Appendix E.

C. Loss Mitigation Expenses

HUD initiated a loss mitigation program in 1996 in an effort to provide opportunities for distressed FHA insured borrowers to retain homeownership. Loss mitigation also reduces foreclosure costs. In the standard process, the mortgagees provide default counseling for borrowers who are behind in their payments, and offer appropriate loss mitigation options to prevent borrowers from losing their homes.

The loss mitigation programs include: (1) special forbearance, (2) loan modification, and (3) partial claim. A special forbearance is a written repayment agreement between the mortgagee and the borrower that contains a plan to reinstate a loan. A loan modification is the process that modifies the contractual terms of mortgage permanently, such as lowering the interest rate, increasing the loan term, or reducing the principal balance. Under the partial claim option, a mortgagee will advance funds on behalf of a mortgagor in an amount necessary to reinstate a delinquent loan. The borrowers are required to sign a promissory note and a subordinated mortgage payable to FHA.

Loan mitigation cases increased dramatically from FY 2000 to FY 2009, the latest fiscal year with reliably finalized cash flows. There were 11,402 loss mitigation claims in FY 2000 which

increased to 122,912 cases in FY 2009. The amount FHA paid in these cases after all adjustments and curtailments was $21.88 million in FY 2000 which increased to $265.5 million in FY 2009. Loss mitigation payments made by FHA include administrative fees, costs of title searches, recording fees, and subordinated mortgage note amounts.

To estimate the loss mitigation payment, we estimated a linear regression model with zero constant term and the total claim payment during the quarter as the explanatory variable:

$$Loss\ Mitigation\ Payment = 0 + b^* Claim\ Payment$$

The estimation uses quarterly aggregated data for loss mitigation payment amounts and total claim payments from FY 2002 to FY 2009. The estimated coefficient of claim payment is 0.058, meaning that loss mitigation expenses are typically about 5.80 percent of the total claim losses during an exposure quarter.

D. Refunded Premiums

FHA first introduced the upfront premium refund program in 1983. It specified that FHA would refund a portion of the upfront premium when a household prepaid its mortgage. The upfront premium was considered to be "earned" over the life of the loan. Upon prepayment, an approximation of the unearned upfront premium is returned to the borrower. Therefore, the amount of the refund depends on the time from origination to when the mortgage is prepaid. For modeling purposes, the refund payments are calculated as follows:

Refund Payments =
*Original UPB * Upfront Premium Rate * Conditional Prepayment Rate * Refund Rate*

In the past, borrowers could receive the upfront premium refund when they prepaid their mortgages before the maturity of the mortgage contract. In 2000, FHA changed its policy so that borrowers would obtain refunds only if they prepaid within the first five years of their mortgage contracts. The most recent policy change at the end of 2004 eliminated refunds for early prepayments of any mortgages endorsed after that date, except for those borrowers who refinanced into a new FHA loan within 3 years following the original endorsement date. We assume that about nineteen percent of future prepayments are refinanced into another FHA loan, following the average historical rate.

The upfront premium refund rate schedules for different endorsement dates are presented in Exhibit B-5.

Exhibit B-5: Percentage of Upfront Premium Refunded

Years since Origination	9/1/83~12/31/93		1/1/94~ 12/31/00[a]	1/1/01 and later[b]	12/8/2004 and later[c]
	30-Year Mortgages	15-Year Mortgages	All Mortgages	All Mortgages	If Refinanced into Another FHA Loan
1	0.99	0.99	0.95	0.85	0.58
2	0.94	0.93	0.85	0.65	0.34
3	0.82	0.81	0.70	0.45	0.10
4	0.67	0.66	0.49	0.25	0.00
5	0.54	0.51	0.30	0.10	
6	0.43	0.39	0.15	0.00	
7	0.35	0.29	0.04		
8	0.29	0.21	0.00		
9	0.24	0.15			
10	0.21	0.11			
11	0.18	0.08			
12	0.16	0.06			
13	0.15	0.04			
14	0.13	0.03			
15	0.12	0.02			
16	0.11	0.00			
17	0.10				
18	0.09				
19	0.09				
20	0.08				
21	0.07				
22	0.07				
23	0.06				
24	0.05				
25	0.05				
26	0.04				
27	0.04				
28	0.04				
29	0.04				
30	0.00				

[a] Based on Mortgagee Letter 94-1, which provided a monthly schedule of refund rates
[b] Based on Mortgagee Letter 00-38
[c] Based on Mortgagee Letter 05-03, which provided a monthly schedule of refund rates. Applicable only if refinanced into a new FHA loan.

IV. Economic Value

Once all the above future cash flow components are estimated, their present value can be computed through discounting them at an appropriate rate. The economic value is the sum of the present value of future cash flows plus the current capital resources.

A. Discount Factors

The discount factors applied in computing the present value of cash flows are the official quarterly Federal credit subsidy present value conversion factors. The discount factors vary depending on how far into the future a cash flow will occur. The discount factors are shown in Exhibit B-6. As an example, a cash flow occurring at the end of FY 2013 is multiplied by 0.9930 to convert it into a present value in FY 2012. The discount factors used in this Review are smaller than the corresponding discount factors in last year's Review.

Exhibit B-6: Discount Factors

Year that Cash Flow Occurs	Discount Factor	Year that Cash Flow Occurs	Discount Factor	Year that Cash Flow Occurs	Discount Factor
2013	0.9930	2024	0.6662	2035	0.3779
2014	0.9790	2025	0.6342	2036	0.3581
2015	0.9609	2026	0.6033	2037	0.3393
2016	0.9368	2027	0.5737	2038	0.3213
2017	0.9078	2028	0.5453	2039	0.3043
2018	0.8754	2029	0.5180	2040	0.2880
2019	0.8405	2030	0.4920	2041	0.2726
2020	0.8050	2031	0.4670	2042	0.2579
2021	0.7693	2032	0.4431	2043	0.2440
2022	0.7339	2033	0.4204	2044	0.2309
2023	0.6994	2034	0.3986	2045	0.2184

B. Calculating the Economic Value

The economic value of the Fund as of the end of FY 2012 was calculated first by determining the present value of the future cash flows for all surviving loans as of September 30, 2012. This figure was then added to the capital resources of the Fund, estimated as of the same date.

For each fiscal year beyond 2012, the economic value of the fund as of the end of the fiscal year is calculated by the following equation:

Year End Economic Value =
Economic Value at the beginning of the year + Total Investment Return on the Beginning Economic Value + Economic Value of the New Book of Business

The return on investment of the beginning economic value for each of the future fiscal years is assumed to equal the one-year Treasury forward rates implied by the Federal credit subsidy discount factors. Specifically, these rates are shown in Exhibit B-7.

Exhibit B-7: Interest Rate Earned by the Fund

Fiscal Year	Interest Rate (%)
2013	0.70%
2014	1.43%
2015	1.88%
2016	2.57%
2017	3.19%
2018	3.70%
2019	4.15%

V. Cash Flow Override

A. Asset Sales Override

FHA began selling distressed single family loans through what is now the *Distressed Asset Stabilization Program* in 2010 and has successfully sold more than 2,100 single family loans to date. [35] On July 18th, 2012, HUD announced expansion sales of distressed FHA loans. Under its *Distressed Asset Stabilization Program* on Sep 12, HUD will be selling about 9,000 defaulted

[35] Distressed Asset Stabilization Program Announcement , July18,2012
http://portal.hud.gov/hudportal/HUD?src=/press/press_releases_media_advisories/2012/HUDNo.12-116

loans ,about 40 percent of which will be located in four metropolitans areas particularly hard-hit by the foreclosure crisis and with large inventories of real estate owned(REO) properties: Chicago, Newark, N.J.; and Tampa, Fla. This year's Review implemented this policy change, and assumed 9,747 defaulted loans were claims at FY 2012Q4. In addition, FHA expected to sell another 14,771 defaulted loans, following a 601 auction in December. Our model assumes these loans had become claims by FY 2013Q1.

B. Foreclosed Loans and Delayed Claim Override

After the US mortgage market melt-down, the number of delinquent loans dramatically. Starting in 2008, banks sometimes did not t follow appropriate formal procedures to foreclose a mortgage and they were penalized. Since then many banks are taking extra precautions in the foreclosure procedures to avoid the risk of not being paid by the mortgage insurers. As of June 30, 2012, FHA has a large inventory of loans than have begun the foreclosure process , or even have completed the foreclosure process but have not yet filed as claims. In the meanwhile, we observed large decrease in claim cases after FY 2009 because of the large inventory in the foreclosure process. In this year's model, we identified 74,915 loans in default that have completed foreclosure but have not yet filed as claims. We assume these loans will become claims during FY 2013Q3 to FY 2014Q4.

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Appendix C

Data for Loan Performance Simulations

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Appendix C: Data for Loan Performance Simulations

This appendix describes the methodology used to produce the data necessary for the forecasts of future loan performance. We first describe how loan event data for future time periods were generated to project future loan performance and mortgage-related cash flows. This required creating future event data both for existing books of business and for future loan cohorts not yet originated. Then we summarize how the economic forecasts were applied. The economic forecasts are discussed in Appendix D.

I. Future Loan Event Data

The development of future loan event data was closely integrated with the development of the data used in the statistical estimation of loan performance. As described in Appendix A, the process of building the historical loan event data entailed expanding FHA loan origination records into dynamic quarter-to-quarter event data from loan origination up to and including the period of loan termination. The loan event data were augmented with external economic data (house price indexes and interest rates) to derive a number of time-varying predictors of conditional loan status transition rates. The transition events are current-to-default (default is 90+ delinquent), current-to-current_X (default and cure within same quarter), current_to_streamline refinance, current-to-prepay, default-to-claim, default-to-prepay, default-to-cure by modification, and default-to-cure by non-modification assistance.

For loans that did not terminate and are still in either current or in default status as of FY 2012Q2, the process of building the future period-by-period event data followed the same procedure as for terminated loans, but used forecasted values of the external economic factors to project future loan termination rates and cash flows.

In addition, for the purpose of projections of future economic values , we forecasted the loan performance of future FHA books originated through FY 2019. The dollar endorsement volumes for FY 2012 through FY 2019 are provided by our FHA mortgage volume model described in Appendix F. Based on Moody's baseline scenario, Exhibit C-1 shows the volume model's projected dollar volumes and product share distribution.

These forecasted volumes are allocated among the six loan-product types following their distribution in the most recent endorsements over FY 2011Q3 to FY 2012Q2. HUD provided detailed projected compositions by LTV and credit score . Exhibits C-2 and C-3 present HUD's assumed composition projection for for-purchase and fully underwritten mortgages of future books for the base-case scenario. Also, we assumed stable proportions of product types for fully underwritten mortgages over FY 2012 to FY 2019 as presented in Exhibit C-4.

Exhibit C-1: Forecasted FHA Dollar Volumes ($ mm) and Shares

Period	FHA Purchase Volume	FHA Fully Underwritten Refi Volume	FHA Streamline Refi Volume	Total FHA Volume
FY2012	$136,108	$44,639	$30,990	$211,737
FY2013	$125,929	$40,878	$52,798	$219,605
FY2014	$126,211	$14,520	$26,300	$167,031
FY2015	$134,418	$21,016	$20,590	$176,024
FY2016	$135,155	$38,625	$47,452	$221,233
FY2017	$127,689	$45,142	$58,790	$231,621
FY2018	$131,827	$47,121	$56,584	$235,533
FY2019	$137,147	$44,476	$61,036	$242,660

Period	FHA Purchase Share	FHA Fully Underwritten Refi Share	FHA Streamline Refi Share
FY2012	64.3%	21.1%	14.6%
FY2013	57.3%	18.6%	24.0%
FY2014	75.6%	8.7%	15.7%
FY2015	76.4%	11.9%	11.7%
FY2016	61.1%	17.5%	21.4%
FY2017	55.1%	19.5%	25.4%
FY2018	56.0%	20.0%	24.0%
FY2019	56.5%	18.3%	25.2%

Exhibit C-2: Base-Case Composition of For-Purchase Mortgages

		Projected Composition of FY 2012 Purchase Loans							
Loan-to-Value Ratio	Term	FICO Score Range							
		Missing	300-499	500-579	580-619	620-659	660-679	680-719	720-850
X ≤ 90	30 Yr	0.05%	0.00%	0.05%	0.28%	1.57%	1.09%	1.81%	2.45%
	15 Yr	0.66%	0.00%	0.17%	1.06%	6.16%	4.93%	10.11%	17.15%
90 < X ≤ 95	30 Yr	0.03%	0.00%	0.00%	0.25%	1.58%	1.16%	2.17%	3.30%
	15 Yr	0.02%	0.00%	0.00%	0.12%	0.95%	0.85%	1.79%	3.28%
95 < X	30 Yr	0.18%	0.00%	0.00%	2.13%	20.41%	12.88%	20.61%	28.00%
	15 Yr	0.16%	0.00%	0.00%	0.60%	7.89%	7.01%	13.81%	23.28%

		Projected Composition of FY 2013 Purchase Loans							
Loan-to-Value Ratio	Term	FICO Score Range							
		Missing	300-499	500-579	580-619	620-659	660-679	680-719	720-850
X ≤ 90	30 Yr	0.05%	0.00%	0.05%	0.28%	1.57%	1.09%	1.81%	2.45%
	15 Yr	0.66%	0.00%	0.17%	1.06%	6.16%	4.93%	10.11%	17.15%
90 < X ≤ 95	30 Yr	0.03%	0.00%	0.00%	0.25%	1.58%	1.16%	2.17%	3.30%
	15 Yr	0.02%	0.00%	0.00%	0.12%	0.95%	0.85%	1.79%	3.28%
95 < X	30 Yr	0.18%	0.00%	0.00%	2.13%	20.41%	12.88%	20.61%	28.00%
	15 Yr	0.16%	0.00%	0.00%	0.60%	7.89%	7.01%	13.81%	23.28%

		Projected Composition of FY 2014 Purchase Loans							
Loan-to-Value Ratio	Term	FICO Score Range							
		Missing	300-499	500-579	580-619	620-659	660-679	680-719	720-850
X ≤ 90	30 Yr	0.07%	0.00%	0.10%	0.42%	1.68%	1.06%	1.75%	2.54%
	15 Yr	1.07%	0.00%	0.55%	1.36%	6.83%	4.79%	9.35%	16.24%
90 < X ≤ 95	30 Yr	0.04%	0.00%	0.00%	0.35%	1.59%	1.09%	2.13%	3.75%
	15 Yr	0.04%	0.00%	0.00%	0.35%	1.02%	0.74%	1.80%	3.17%
95 < X	30 Yr	0.32%	0.00%	0.00%	3.70%	19.79%	11.51%	19.44%	28.67%
	15 Yr	0.26%	0.00%	0.00%	2.42%	8.31%	6.38%	12.66%	22.66%

Loan-to-Value Ratio	Term	Projected Composition of FY 2015 - 2019 Purchase Loans							
		FICO Score Range							
		Missing	300-499	500-579	580-619	620-659	660-679	680-719	720-850
X ≤ 90	30 Yr	0.08%	0.00%	0.15%	0.57%	1.79%	1.02%	1.89%	2.43%
	15 Yr	1.47%	0.00%	0.94%	1.65%	7.50%	4.65%	8.59%	15.33%
90 < X ≤ 95	30 Yr	0.06%	0.00%	0.00%	0.46%	1.60%	1.02%	2.60%	3.69%
	15 Yr	0.07%	0.00%	0.00%	0.59%	1.09%	0.62%	1.81%	3.06%
95 < X	30 Yr	0.45%	0.00%	0.00%	5.28%	19.18%	10.14%	19.27%	28.32%
	15 Yr	0.36%	0.00%	0.00%	4.25%	8.72%	5.75%	11.51%	22.04%

Exhibit C-3: Base-Case Composition of Fully Underwritten Refinance Loans

Loan-to-Value Ratio	Term	Projected Composition of FY 2012 Fully Underwritten Refinance Loans							
		FICO Score Range							
		Missing	300-499	500-579	580-619	620-659	660-679	680-719	720-850
X ≤ 90	30 Yr	0.04%	0.00%	0.92%	1.36%	12.38%	8.84%	12.62%	13.19%
	15 Yr	0.02%	0.00%	0.15%	0.72%	8.67%	7.29%	14.65%	38.69%
90 < X ≤ 95	30 Yr	0.02%	0.00%	0.00%	0.28%	3.34%	2.96%	5.63%	8.63%
	15 Yr	0.01%	0.00%	0.00%	0.08%	1.26%	1.35%	3.10%	7.18%
95 < X	30 Yr	0.02%	0.00%	0.00%	0.44%	4.70%	3.72%	7.44%	13.47%
	15 Yr	0.00%	0.00%	0.00%	0.06%	1.48%	1.57%	3.89%	9.83%

Loan-to-Value Ratio	Term	Projected Composition of FY 2013 Fully Underwritten Refinance Loans							
		FICO Score Range							
		Missing	300-499	500-579	580-619	620-659	660-679	680-719	720-850
X ≤ 90	30 Yr	0.04%	0.00%	0.92%	1.36%	12.38%	8.84%	12.62%	13.19%
	15 Yr	0.02%	0.00%	0.15%	0.72%	8.67%	7.29%	14.65%	38.69%
90 < X ≤ 95	30 Yr	0.02%	0.00%	0.00%	0.28%	3.34%	2.96%	5.63%	8.63%
	15 Yr	0.01%	0.00%	0.00%	0.08%	1.26%	1.35%	3.10%	7.18%
95 < X	30 Yr	0.02%	0.00%	0.00%	0.44%	4.70%	3.72%	7.44%	13.47%
	15 Yr	0.00%	0.00%	0.00%	0.06%	1.48%	1.57%	3.89%	9.83%

Loan-to-Value Ratio	Term	Projected Composition of FY 2014 Fully Underwritten Refinance Loans							
		FICO Score Range							
		Missing	300-499	500-579	580-619	620-659	660-679	680-719	720-850
X ≤ 90	30 Yr	0.09%	0.00%	1.27%	2.97%	13.69%	8.27%	11.52%	11.86%
	15 Yr	0.08%	0.00%	0.80%	2.38%	12.78%	8.75%	15.95%	33.05%
90 < X ≤ 95	30 Yr	0.05%	0.00%	0.00%	0.97%	4.47%	3.11%	5.68%	8.35%
	15 Yr	0.02%	0.00%	0.00%	0.26%	1.62%	1.44%	3.00%	6.02%
95 < X	30 Yr	0.05%	0.00%	0.00%	0.97%	5.42%	3.60%	6.72%	10.94%
	15 Yr	0.01%	0.00%	0.00%	0.19%	1.64%	1.39%	3.25%	7.37%

Loan-to-Value Ratio	Term	Projected Composition of FY 2015-2019 Fully Underwritten Refinance Loans							
		FICO Score Range							
		Missing	300-499	500-579	580-619	620-659	660-679	680-719	720-850
X ≤ 90	30 Yr	0.15%	0.00%	1.62%	4.57%	14.99%	7.70%	10.41%	10.53%
	15 Yr	0.15%	0.00%	1.44%	4.04%	16.90%	10.21%	17.25%	27.42%
90 < X ≤ 95	30 Yr	0.07%	0.00%	0.00%	1.67%	5.59%	3.27%	5.73%	8.06%
	15 Yr	0.03%	0.00%	0.00%	0.45%	1.97%	1.52%	2.90%	4.86%
95 < X	30 Yr	0.07%	0.00%	0.00%	1.50%	6.15%	3.47%	5.99%	8.46%
	15 Yr	0.01%	0.00%	0.00%	0.33%	1.80%	1.21%	2.61%	4.90%

Exhibit C-4: Product Type Distribution of Fully Underwritten Mortgages for FY 2012Q2-2019Q4

Product Type	Proportion
Fixed-Rate 30 Year Mortgages	87.51%
Fixed-Rate 15 Year Mortgages	9.55%
Adjustable Rate Mortgages	2.94%

The development of loan-level data for future loans is as follows. Each future loan cohort is based on duplication of the loan-level data records for the last full year of historical data – corresponding to the last two quarters of FY 2011 and the first two quarters of FY 2012. While this basic approach imposes the assumption that future detailed loan characteristics occur with the same distribution as for recent FHA endorsements, several adjustments are made to ensure consistency with future economic conditions and volume forecasts. For example, the starting mortgage coupons for all products are updated to reflect forecasted market conditions at the time of origination of these projected loan cohorts. This is achieved by adjusting the loan-level

coupons up or down by the same percent change as occurred for the average market mortgage rate.

Streamline refinance (SR) loans require some additional adjustments specific to those products. For SR loans, current LTV values are based on linking the SR loan to the prior fully underwritten mortgage loan that was made to the same FHA borrower. If a future loan origination is duplicated from an FY 2011-2012 SR origination that is linked to a prior fully underwritten loan originated within two years previously, the future SR loan originations uses that prior loan data when estimating the current LTV.

II. Future Economic Forecasts

Our source for the quarterly economic forecast data was Moody's Analytics, for interest rates and house price appreciation rates. For the projection of future changes in housing values, we used Moody's forecast of the FHFA MSA-level and state-level housing price indexes. Because the Moody's baseline HPI forecast is an expected trend forecast, it tends to smooth out intertemporal volatility in house price appreciation rates. There is also an additional layer of uncertainty with regard to the dispersion of individual house price appreciation rates around the market average, represented by the local-level HPI. When using Moody's local house price forecasts to compute the probability of negative equity, it is important to take into account both sources of uncertainty. We adopt the Yang, Lin, and Cho methodology[36] to incorporate these two sources of dispersion of future house price indexes at each location. Specifically, Equation (8) in Appendix A of this Review is modified as follows for all future time periods:

$$\sigma(t) = \sqrt{a \cdot t + b \cdot t^2}$$

where parameters "*a*" and "*b*" were estimated by FHFA for each location.

The source of house price appreciation rates for historical loans is the local HPIs published by FHFA. In assigning metropolitan area indexes, we first used the Metropolitan Statistical Area Division (MSAD) index if the index exists for the loan's Federal Information Processing Standards (FIPS) state-county code. If MSAD doesn't exist, we used the Core Based Statistical Area (CBSA) index if that index is available. In case neither the MSAD nor CBSA index is available, we applied the corresponding state-level HPIs.

As described in Appendix A, the indexes are used in conjunction with estimates of house price diffusion parameters to compute probabilities of negative equity at each loan age for individual borrowers. The dispersion estimates reflect the deviations among individual house price

[36] See Equation (20) in Yang, Tyler T., Che-Chun Lin, and Man Cho, "Collateral Risk in Residential Mortgage Defaults," *Journal of Real Estate Finance and Economics*, Vol. 42, No. 2, pp. 115-142, 2011.

appreciation rates around the MSA or state average appreciation rates computed retrospectively by the HPIs.

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Appendix D

Economic Forecasts

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Appendix D: Economic Forecasts

In order to measure the Fund's resilience against potential future losses on current and future portfolios, the economic value of the Fund was estimated under the baseline Monte Carlo simulation framework and for six alternative deterministic economic scenarios. Our Monte Carlo paths are centered on the Moody's deterministic forecast in the sense that our values are just as likely to lie above the Moody's forecast as they are to lie below them. For this calibration we used the July 2012 forecast of the U.S. economy published by Moody's Analytics. For purposes of our Review, the components of Moody's forecasts are:

- FHFA house price indices (HPIs) at the MSA and Census division levels
- Unemployment rates at the MSA and Census division levels
- Ten-year constant maturity Treasury rate
- One-year constant maturity Treasury rate
- Commitment rate on 30-year fixed-rate mortgages

An annual and national summary of these time series used in the baseline scenario is presented in Exhibit D-1, although we used a quarterly frequency and a local HPI and unemployment rate in deriving the Economic Value of the MMI fund and in the stress scenarios. The quarterly economic factors forecasted by Moody's were available from FY 2012 through FY 2042.

Exhibit D-1: Summary of Moody's Baseline Scenario

Economic Forecast[a]					
Fiscal Year	**FHFA National Housing Price Index**	**Commitment Rate on 30-Year Fixed-Rate (%)**	**1-Year Treasury Rate (%)**	**10-Year Treasury Rate (%)**	**National Unemploy-ment Rate**
2012	316.69	3.91	0.21	2.05	8.14
2013	318.89	5.03	0.40	3.25	7.88
2014	327.99	6.44	1.08	4.59	6.98
2015	343.25	6.56	2.57	4.70	6.17
2016	357.94	6.61	3.67	4.90	5.64
2017	370.71	6.51	3.73	4.93	5.52
2018	382.84	6.37	3.65	4.91	5.64
2019	396.55	6.30	3.56	4.91	5.68
2020	411.54	6.15	3.55	4.90	5.70
2021	427.23	6.10	3.54	4.88	5.73
2022	442.89	6.03	3.54	4.87	5.76

[a] Source: Moody's Analytics July 2012 Forecast. Numbers are average levels during each fiscal year.

I. Alternative Scenarios

To conduct stress scenarios of the Fund's economic value, six alternative scenarios were used to assess the financial viability of the Fund. These six scenarios are:

- 10th Best Path in Simulation
- 25th Best Path in Simulation
- 25th Worst Path in Simulation
- 10th Worst Path in Simulation
- Worst Path in Simulation
- Moody's Protracted Slump
- Low Interest Rates

The first five alternative scenarios are the 10th best, 25th best, 25th worst, 10 th worst and the worst paths of the 100 stochastic Monte Carlo simulation paths. The details of constructing different stochastic simulation paths can be found in Appendix H.
The next one alternative scenario was based on modified versions of the July 2012 alternative economic forecasts published by Moody's Analytics. Moody's projection of alternative future scenario assumes that the local house price appreciation rate (HPA) will change from that of the baseline scenario by a constant rate across all locations for each future quarter. Moody's also assumes that future HPI levels will converge to those of the baseline scenario. This assumption implies that under pessimistic scenarios, the lower short-term HPA will be followed by a period of stronger HPA.

Instead of assuming that the HPI will converge to a stable level in the long run, an alternative assumption widely used in the mortgage industry is that HPA will converge to a stable rate. As we did in last year's Review, we modified Moody's alternative HPI scenario to be consistent with this view. Specifically, the quarterly HPA rates were computed for the baseline and the Moody's alternative scenario. Each alternative scenario follows the original Moody's HPA path, until the quarterly HPA crosses that of the baseline scenario. Following the quarter of the HPA's cross-over, the HPA of the baseline scenario is applied to generate the remainder of the scenario. The cross-over quarter is FY 2014 Q2. This modification ensures thatthe HPA rate in a pessimistic scenario will never exceed that of the baseline scenario.

We also constructed another alternative scenario. In Moody's baseline and alternative economic scenario, the future paths of interest rates all rise rapidly in the near term. On September 13, 2012 the Fed announced that "……the Committee also decided today to keep the target range for the federal funds rate at 0 to 1/4 percent and currently anticipates that exceptionally low levels for the federal funds rate are likely to be warranted at least through mid-2015." Based on this new position, the interest rates is likely to remain at its currently very low level for an extended time period. Hence, for the third scenario we coupled the baseline home price scenario with an interest rate path that remains at the current very low level for another two years.

II. Graphical Depiction of the Scenarios

Exhibit D-2 shows the future movements of the national HPI under the baseline and five of the six alternative economic scenarios (the low-interest-rates scenario uses the HPI scenario of the base case). This graph shows that the differences among these scenarios depend on the severity and duration of the housing recession. Under the baseline scenario, the HPI does not return to its FY 2007 level until FY 2018, and much longer after that for all the pessimistic scenarios.

Exhibit D-2: Paths of the Future National House Price Index in Different Scenarios

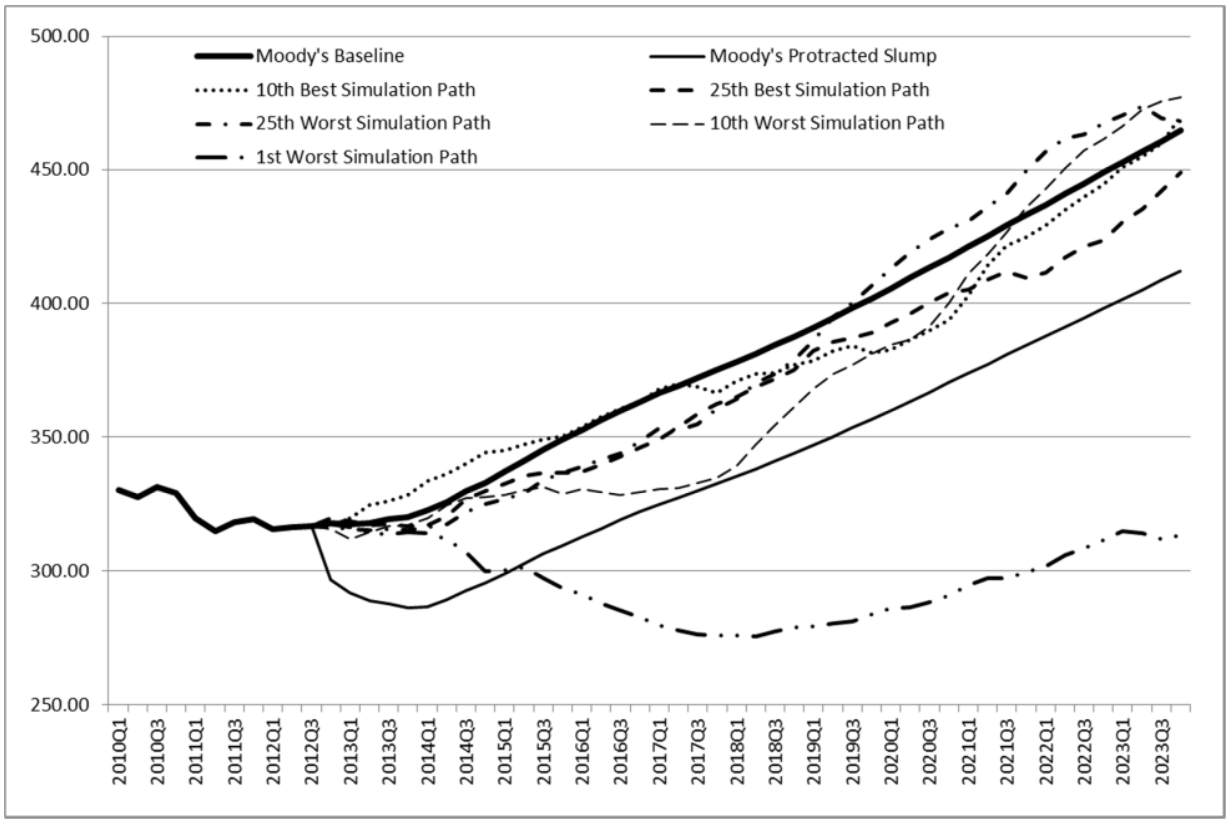


Exhibit D-3 shows the forecasted mortgage interest rate of 30-year fixed-rate mortgages in the baseline and the six alternative scenarios. The mortgage rates across Moody's scenarios rise together and bunch around 6.6 percent within two years and mean-revert to around 6.0 percent in FY 2021. In addition, Moody's model that generated the scenarios suggests stagflation wherein the protracted slump scenario coincides with the highest levels of rates and conversely for the stronger near-term rebound scenario. The low interest rate path representing a two-year persistence of low rates contrasts sharply with Moody's paths and broadens the range of economic outcomes that might impact the Fund.

Exhibit D-3a: Paths of the Future Mortgage Interest Rate (%) in Different Scenarios

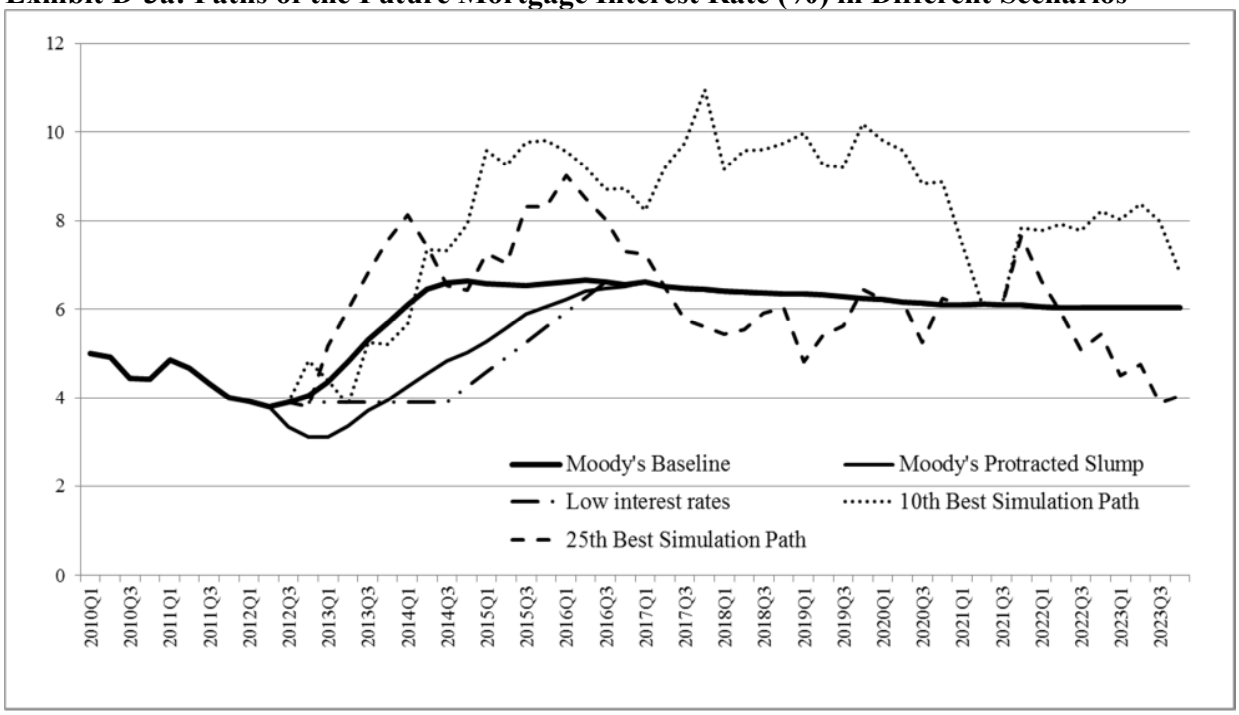


Exhibit D-3b: Paths of the Future Mortgage Interest Rate (%) in Different Scenarios

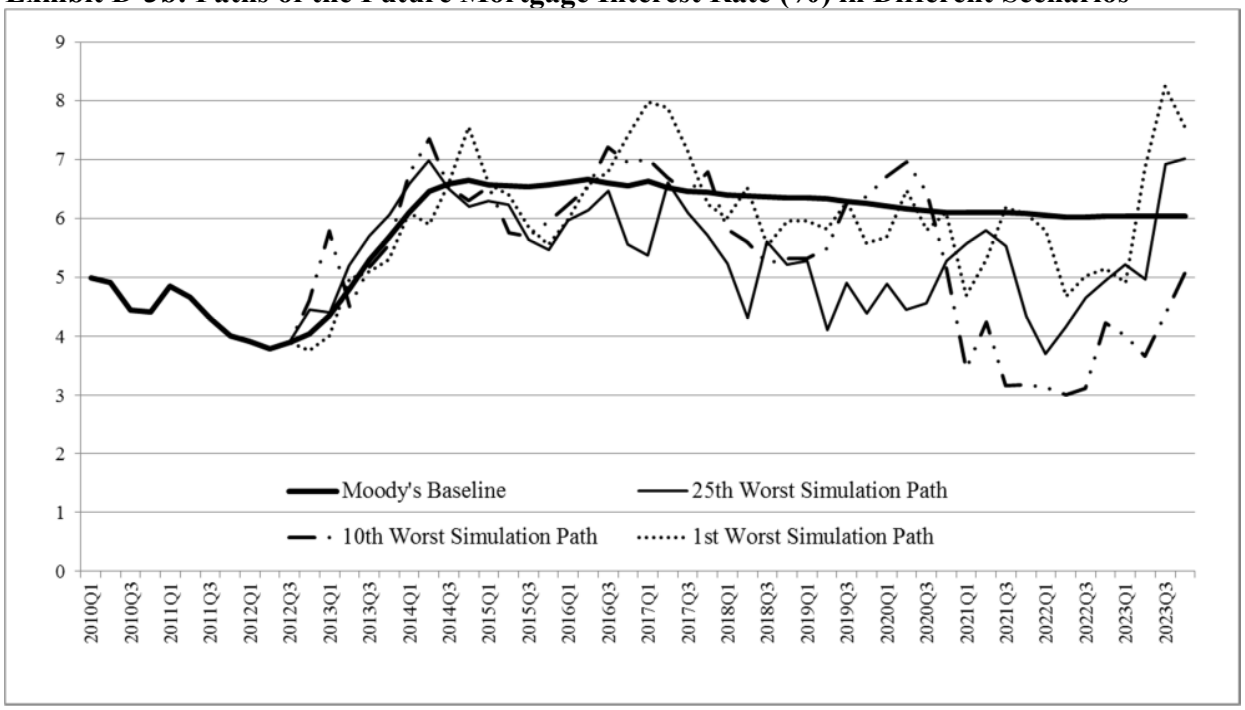
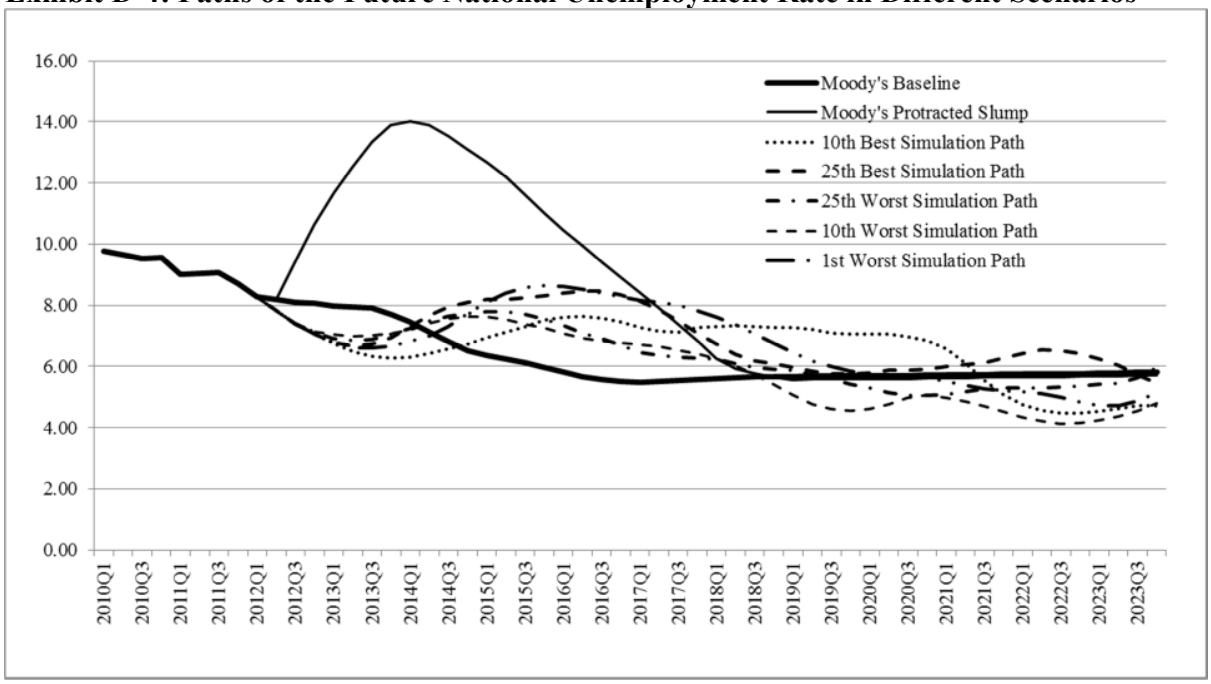


Exhibit D-4 shows the forecasted unemployment rate under different scenarios.

Exhibit D-4: Paths of the Future National Unemployment Rate in Different Scenarios



The projected performance of the Fund corresponding to the selected scenarios described above was presented in Section V of this Review.

Appendix E

Loss Severity Model

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Appendix E: Loss Severity Model

This appendix describes the loss severity model used in the FY 2012 Review. One of the primary sources of variation in the MMI Fund performance has been the loss severity experienced on loans that terminate as claims. In the case of a single loan, this loss, expressed as a percentage of the remaining unpaid principal balance at the claim date, is referred to as the "loss rate" or the "loss severity rate."[37] Up until the FY 2008 Review fixed loss severity rates were used. The loss rate model used in this Review was first developed during the FY 2009 Review and was updated in the FY 2010 and 2011 Reviews. In this Review, in addition to using the most recent data for completed claims, structural changes were introduced in the loss severity model. Section I summarizes the specification and estimation approaches of the new model, Section II describes the explanatory variables used in this model, and Section III presents the estimation results.

I. Model Specification and Estimation Approaches

When an FHA-endorsed loan terminates as a claim; the property is "conveyed" to HUD and HUD typically makes a payment to the loan servicer to settle the claim and acquires the underlying property—that is, it becomes real estate owned, or REO. The claim payment HUD makes to the servicer, known as the "acquisition cost," consists of three components: the outstanding unpaid principal balance on the loan; the foregone interest advanced to HUD by the servicer as a result of the loan default; and legal and administrative costs paid by the servicer associated with foreclosure, including any expenses associated with the cost of repairing or maintaining the property prior to conveyance of the property to HUD:

$$\textit{Acquisition Cost} = \textit{Unpaid Principal Balance} + \textit{Foregone Interest} + \textit{Foreclosure Expense}$$

Following acquisition, HUD attempts to sell the property, sometimes at a reduced price in order to assist low-income prospective homebuyers to buy a house. During the period when the property is held by HUD, but not yet sold, HUD incurs various holding costs associated with maintenance, repairs, tax payments and expenses incurred preparing the property for sale. Upon sale of the collateral property, HUD receives the sales price less any sales expenses. In sum, the loss amount is the net amount that HUD incurs from this process:

$$\textit{Loss Amount} = \textit{Acquisition Cost} + \textit{Holding Cost} - \textit{Sales Price} + \textit{Sales Expense}$$

HUD permits pre-foreclosure sales (PFS) as an alternative to the foreclosure process. In pre-foreclosure sales, the property is sold without the foreclosure process being completed or even started in some cases. Instead of acquiring the foreclosed house, HUD directly pays the loss

[37] This definition is different from HUD's definition, which uses the acquisition cost as the denominator of the loss rate.

amount claimed by the servicer. The loss amount of a pre-foreclosure sale case is reported as the acquisition cost to HUD.

For both foreclosures and pre-foreclosure sales, the loss amount expressed as a percentage of the unpaid principal balance is referred to as the "loss rate" or "loss severity rate":

$$Loss\ Rate = \frac{Loss\ Amount}{Unpaid Principal Balance}$$

Exhibit E-1 shows the distribution of different types of FHA claim terminations. Conveyance refers to the foreclosure procedure discussed above, wherein the property is conveyed to HUD after foreclosure is completed. This is the most common type of claim.

There was a significant volume of asset (non-performing loan) sales from FY 2003 through FY 2006. In these cases, the remaining foreclosure procedures or house sales were avoided by HUD. However, asset sales have been ad hoc events, and there is no evidence that HUD will conduct further asset sales in the foreseeable future. Hence, we have not included them in our model estimation sample. The Coinsurance and Without Conveyance categories have been insignificant in volume over this period and are also omitted from our analysis. The consistent stable pattern of pre-foreclosure sales suggests that they are likely to continue to be used as the dominant form of non-conveyance claim settlement going forward. Consequently, the loss severity rate that we model is based only on the losses observed under the Conveyance and Pre-Foreclosure Sales categories.

Exhibit E-1: Percentages of Claim Termination Types by Fiscal Year

Claim Year	Conveyance	Asset Sales/ Accelerated Claims Disposition	Coinsurance	Without Conveyance	Pre-Foreclosure
1999	94.43	0.09	0.02	0.00	5.46
2000	94.71	0.07	0.01	0.00	5.21
2001	94.69	0.00	0.00	0.00	5.31
2002	94.10	0.00	0.00	0.00	5.90
2003	86.50	8.60	0.00	0.00	4.90
2004	85.96	8.32	0.00	0.00	5.72
2005	84.40	9.16	0.00	0.00	6.43
2006	90.06	2.70	0.00	0.00	7.24
2007	93.08	0.00	0.00	0.00	6.92
2008	93.14	0.00	0.00	0.06	6.80
2009	89.99	0.00	0.00	0.04	9.96
2010	85.09	0.31	0.00	0.00	14.60
2011	78.40	1.09	0.00	0.00	20.51

Exhibit E-2 presents the loss severity rates by termination fiscal year over the 1991-2011 periods. The loss rate has been steadily increasing since FY 2005, mainly due to the widespread slump in the housing market. Starting from FY 2010, the loss rate has dropped significantly from previous years, due to a higher share of pre-foreclosure sales.

Exhibit E-2: Historical Loss Rates

Termination Year	Loss Rate	Termination Year	Loss Rate
1991	47.17%	2001	34.88%
1992	46.16%	2002	33.84%
1993	45.56%	2003	35.30%
1994	45.34%	2004	37.45%
1995	44.75%	2005	39.87%
1996	41.06%	2006	45.13%
1997	40.24%	2007	54.80%
1998	40.78%	2008	62.92%
1999	40.86%	2009	60.20%
2000	37.96%	2010	47.63%

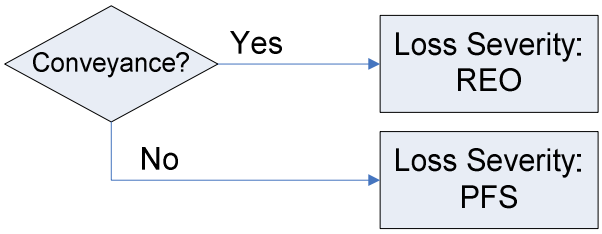
A. Specification of the Loss Severity Model

As described above, there are several components of the total loss amount, and each component can be influenced by a number of factors. Foregone interest depends on the interest rate on the mortgage and on the length of the default-to-claim lag. Foreclosure expenses can vary depending on whether a judicial foreclosure process is used that can shorten the foreclosure process time and this varies by state. Repair expenses may be a function of the financial condition of the mortgagor, which we proxy by the credit score. Sales prices are influenced by the house price appreciation since origination and by the prevailing local housing market conditions during the default and property disposition periods. Several components of the loss amount involve expenses that are fixed across foreclosed properties. Hence, loans with relatively lower unpaid principal balances are more likely to realize higher loss rates since the denominator of the loss ratio will be smaller relative to these fixed components of the numerator.

As shown in Exhibit E-1, the distribution between conveyance (REO) and pre-foreclosure sales (PFS) was relatively stable through FY 2009 Q3. Due to recent widespread house price declines and the higher volume of defaults, starting from FY 2009 Q4, the foreclosure claim process was elongated and the foreclosure claims were delayed, while the pre-foreclosure sales process was relatively stable. Since FY 2009 Q4, the pre-foreclosure sales share increased significantly. Moreover, the proceeds recovered from those claimed properties resale were different between conveyance and pre-foreclosure sales. To accommodate more accurate estimates of loss rates, then, we introduced a two-stage model: (1) a model to account for the choice between a pre-

foreclosure sale (PFS) and conveyance (REO) and (2) their different loss rates conditional on being PFS or REO. The following flowchart describes the major components of the FY 2012 Review loss severity model.

Exhibit E-3: Choice-Based Loss Severity Model



First, we estimate the probability of that a claimed is settled by the conveyance/REO process versus the pre-foreclosure sale (PFS) process. To model this zero-one event, we use a standard binary logistic model to predict whether the probability that a property is conveyed to HUD. The functional form is given by the following logit equation.

$$logit(x) = \ln \frac{\pi(x_i)}{1 - \pi(x_i)} = \beta_0 + \sum \beta_k X_{ki} + e_i$$

Where x_i denotes that the outcome of the claim i is conveyance;
X_{ki} is the value of explanatory variable k for claim i;
the sum is over k;
and e_i is the error term.

Second, we estimate the loss rate as a function of all the same explanatory factors used in the above model of the choice of REO or PFS depending on whether the claim disposition is by REO or PFS; i.e., there are two loss rate equations. In contrast to the conveyance claim probability modeling in the first stage (i.e., the selection model), the loss rate is not bounded between zero and one. It can be more than one hundred percent if the loss amount is more than the unpaid principal balance; but it can also be less than zero if the sale price of the house is more than enough to cover the unpaid principal balance and all associated costs to HUD. The loss rate appears to be a smooth and continuous function of the underlying explanatory variables. We used ordinary least squares (OLS) linear regression to estimate the parameters of the two loss rate models. Conditional on whether the claim is a conveyance or a pre-foreclosure sale, the specification of the regression model is:

$$LossRate_{REO}(X_i | i \in REO) = f(X_i) + \varepsilon_i$$
$$LossRate_{PFS}(X_i | i \in PFS) = g(X_i) + \varepsilon_i$$

where $LossRate(X_i)$ is the realized loss rate of claim i, which emanates from REO (conveyance) or PFS;
X_i includes all explanatory variables for claim i;

and ε_i is the error term.

Thus, the estimated loss rate in the fund is the weighted average of loss rate depending on different claim types.

$$Loss\ Rate = Probablity\ of\ REO * LossRate_{REO} + Probablity\ of\ PFS * LossRate_{PFS}$$

Where probability of REO and PFS are predicted from the loss selection model and *LossRate* (X_i) is predicted from one of the two loss rate models above, as appropriate.

B. Estimation Sample

The sample used to estimate the loss severity model for the FY 2012 Review consists of loan-level data from the FHA single-family data warehouse for the categories conveyance and pre-foreclosure sales. The available data cover the period from the first quarter of FY 1975 to the second quarter of FY 2012. The FHA loss mitigation program was initiated in1996 and fully implemented in 2002. Due to the recent elongation of foreclosure timelines and also the elongation of the time from REO to the sale of the property (due to the market being saturated with foreclosure sales) and hence for complete losses being reported to HUD, both of which started around FY 2009 Q4, for the selection model our analysis used the sample with termination years from FY 2002 through FY 2009 Q3. The claim data during this period are more reliable, with completed claim data for which foreclosed loans have been recorded by FHA. We also excluded claims when the records did not include the disposition date of the HUD-owned property, except in the case of pre-foreclosure sales. The final sample used for the selection estimation includes 439,121 loans claimed over these past 8 years. Exhibit E-4 quantifies the impact of the various sample exclusions for the choice model and the two loss rate models.

Many claims associated with foreclosures in FY 2010 or later have not yet been fully resolved, so the conveyance loss rate for these claims will be biased by including the faster property disposition cases, which tend to incur lower losses. REO claims after FY 2010 are excluded from the REO loss rate estimation sample. Given the differences in the disposition process and the recording process between conveyance and pre-foreclosure sale claim types, the REO loss rate model used the sample with termination years from FY 2000 through FY 2009, while the PFS loss rate model used the sample with termination years from FY 2000 through FY 2012 Q2. The claim data during this period are more reliable, with completed claim data for which loss rates have been recorded. The data used in these two loss rate models are processed using the same exclusion rules as for the selection model. The final samples used for the REO and PFS loss rate model estimation included 523,835 and 80,965 claimed loans, respectively.

Exhibit E-4:Claim Counts for the Three Loss Severity Models

	Loan Count
Original Total Claims	1,173,203
Drop cases with UPB = 0 or loan age < 0	15
Drop cases with missing LTV data	104,758
Drop cases with coupon rate = 0	1
Observations Surviving First Round of Exclusions	1,068,429
Drop cases with no disposition year and also claim type not pre-foreclosure	79,484
Drop cases with non conveyance or pre-foreclosure claim type	3,558
Drop with other miscellaneous data quality issues	507
Drop terminations earlier than FY 2000	209,539
Observations Used to Estimate the Models	775,341

II. Explanatory Variables

There are six main categories of explanatory variables applied in the loss severity analysis:

- Fixed initial loan characteristics, including mortgage product type, non-owner occupied;
- Fixed initial borrower characteristics, including borrower credit scores and indicators of the source of downpayment assistance where relevant;
- Fixed property characteristics, including number of units;
- Fixed property state characteristics, including indicators of judicial foreclosure process and whether deficiency judgments are allowed;
- Dynamic variables based entirely on loan information, including mortgage age, scheduled amortization of the loan balance relative loan size, current loan-to-value, default episode duration; and
- Dynamic variables derived by combining loan information with economic time series such as house price appreciation rates (e.g., as it influences the REO sales price) and interest rates (e.g., as used to indicate the refinance incentive).

Exhibit E-5 summarizes the explanatory variables that were used in the loss severity model. All the continuous variables are linear or piece-wise linear variables, while all the indicator variables are 0-1 dummy with one classification of a given set of dummy variables omitted during estimation, corresponding to the baseline category. Many variables are similar as those used in the loan status transition models, including: refinance incentive, source of downpayment assistance, judicial foreclosure process, loan age; mortgage type, borrower credit scores, mortgage rate spread and number of units. The relative loan size was used in the loan transition equations only through the FY2010 Review and not since then. Only the indicator of non-owner occupied and a deficiency judgment state, the current loan-to-value ratio and the foreclosure-period house price appreciation rate are created especially for the loss severity model. We now describe how these four latter variables were constructed.

Non-owner occupied indicator: investor's house seems to be more risky, because the owner is not attached to the house and less likely to maintain the house.

- Non-owner occupied indicator: investor's house seems to be more risky, because the owner is not attached to the house and less likely to maintain the house.

- Deficiency Judgment State: Some states allow lenders to sue borrowers for the lender's losses after foreclosure. We used the website http://www.foreclosurelaw.org/ to identify such "deficiency judgment" states. The possibility of recourse is expected to lower losses, all else equal. This is a variable newly introduced this year.

- Current Loan-to-Value Ratio (CLTV): The CLTV is calculated from the initial LTV according to the amortization schedule and by updating the underlying property value with state-level house price indexes. Since CLTV has significant explanatory power for estimating the loss rate, the original LTV was dropped from loss severity model for the FY 2012 Review

- House Price Appreciation Rate: The house price appreciation rate is by state during the foreclosure period, between default and disposition. This variable is strongly related to the sale price when HUD disposes of the property. In a declining/improving housing market, the loss rate is relatively high/low. We assume the foreclosure process (from default to claim) takes 4 quarters, and the period the real estate is owned by HUD (from claim to disposition) is also 4 quarters. Thus, the appreciation is measured over 8 quarters, centered on the claim date.

Exhibit E-5: Explanatory Variables in the Loss Rate Model

Variable Name	Value	Description
Refinance		
refinance	1 = Refinance loan; 0 = Non-refinance loan	Indicates whether the purpose of the loan was for refinancing
Judicial		
judicial	1 = Judicial state; 0 = Non-judicial state	Indicates whether property is located in a state utilizing a judicial foreclosure process.
Deficiency Judgment State		
deficiency	1 = Deficiency judgment state; 0 = Non-deficiency judgement state	Indicates whether property is located in a state that allows deficiency judgment.
Downpayment Source		
dpa_nonprof	1 = Non-profit gift; 0 = No non-profit gift	Indicates whether downpayment assistance was provided by a non-profit.
Unicon		
flag_unicon	1 = Loan is in the Unicon sample; 0 = Loan is not in the Unicon sample	Indicates whether the loan was sampled from the subset of FHA loans Unicon Corp submitted to credit repositories to obtain retrospective FICO information.
Age		
age	$0 \leq X \leq 120$	Quarterly age of the loans.
Loan Type		
flag_prd_25	1 = 15-year FRM or15-year SR FRM; 0 = Not (15-year FRM or 15-year SR FRM)	Loan product type.
Credit Score		
credit_score	$300 \leq X \leq 850$	Borrower FICO scores range.
credit_score_000	Missing	
credit_score_999	Not Collected	
CLTV		
ltv_current		Current loan-to-value (%) at the claim date. House price is updated by state-level house price indices .
HPA		
hpa2y		Average annual house price appreciation rate during the eight quarters surrounding the claim date.
sigma_parm_a		HPI diffusion volatility parameter a

Default Episode Duration		
def_episode1	X = 1	
def_episode2	X = 2	
def_episode3	X = 3	
def_episode4	X ≥ 4	Default Espidoe Duration (quarterly)
Number of Units		
unit24	1 = The property has more than 2-4 units; 0 = The property has only 1 unit	Dummy variables based on number of units
Owner Occupancy		
nowner_occ	1 = Non-owner occupancy; 0 = Owner ocupancy	Dummy variables based on owner occupancy
Mortgage Rate Spread		
mspread		Yield curve slope measured as spread difference between Freddie PMMS mortgage rate and 10-year CMT rate.
Relative Loan Size		
loansize		Relative loan size measured as loan size relative to the average size loan originated in the same state in the same year (bucketed according to percentages).

III. Estimation Results

Exhibit E-6 presents the regression coefficients and their standard errors and t-statistics.

Exhibit E-6: Regression Results

Variable	Conv/PFS Selection			Loss Rate Given Conv			Loss Rate Given PFS		
	Spline	Coefficient	Chi-Sq	Spline	Coefficient	t-Value	Spline	Coefficient	t-Value
Intercept		8.0951	818.37		0.6905	36.98		-0.2059	-19.12
CLTV spline 1	spline @ 0.95	-0.7770	36.48	spline @ 0.5, 0.9	0.5054	15.62	spline @ 1.2	0.7727	125.83
CLTV spline 2		-0.0606	0.10		1.1040	168.25		0.2097	28.82
CLTV spline 3					0.3063	26.94			
Relative Loan Size 1	spline @ 100, 180	-0.0316	3445.28	spline @ 50, 100, 180	-0.0119	-89.41	spline @ 110	-0.0019	-55.02
Relative Loan Size 2		-0.0106	811.37		-0.0052	-198.75		-0.0002	-7.59
Relative Loan Size 3		-0.0025	2.11		-0.0017	-63.58			
Relative Loan Size 4					-0.0001	-1.19			
2-year HPA centered by termination date 1		-1.0427	174.86	spline @ -0.1, 0.2	-0.1668	-8.41	spline @ -0.1	-0.1145	-5.45
2-year HPA centered by termination date 2					-1.3088	-211.71		-0.0154	-1.98
2-year HPA centered by termination date 3					-0.1224	-12.32			
Age (by quarter) 1	spline @ 60	0.0417	685.18	spline @ 45	0.0112	156.55		0.0117	138.87
Age (by quarter) 2		-0.0954	10.52		0.0172	60.66			
Default Duration =1		-2.5622	18982.12		-0.0490	0.00		-0.1125	-80.20
Default Duration =2		-1.5956	7038.76		-0.0764	0.00		-0.0785	-52.58
Default Duration =3		-0.8594	1878.08		-0.0647	0.00		-0.0519	-32.41
Default Duration >=4		0.0000	.		0.0000	.		0.0000	.
HPA Volatility Sigma A					119.9806	1.32		64.4209	34.35
Mortgage Rate Spread		0.0165	0.49					-0.0194	-10.69
Credit score 1	spline @ 580, 680	-0.0020	19.34		-0.0003	0.00		-0.0002	-24.20
Credit score 2		-0.0014	18.88						
Credit score 3		-0.0036	23.39						
Credit Score Not Collected		0.34	95.50		0.0288	0.00		0.0150	5.64
Missing Credit Score		-0.23	123.76		-0.0001	0.00		-0.0155	-9.04
UNICON Score					0.0261	0.00		-0.0228	-12.26
Judicial State		-0.8760	3468.88		0.0877	0.00		0.0039	3.39
Deficiency State		-0.4229	275.43		-0.0486	0.00		-0.0363	-22.55
Refinance					0.0837	0.00		0.0979	72.06
Non-profit Gift					0.0535	0.00		0.0431	30.97
Number of Units (2-4)		0.3794	58.74		0.1434	0.00		0.1393	35.99
Non-Owner Occupied					-0.0457	0.00		-0.0510	-6.55
Fixed 15-year Product					0.1293	0.00			

Based on quarterly UPB-weighted averages of loan-level terminations, Exhibits E-7 and E-8 show the in-sample loan counts and actual and predicted loss rates by fiscal year. The fit appears to be reasonable.

Exhibit E-7: In-Sample Model Fit of REO Loss Rates

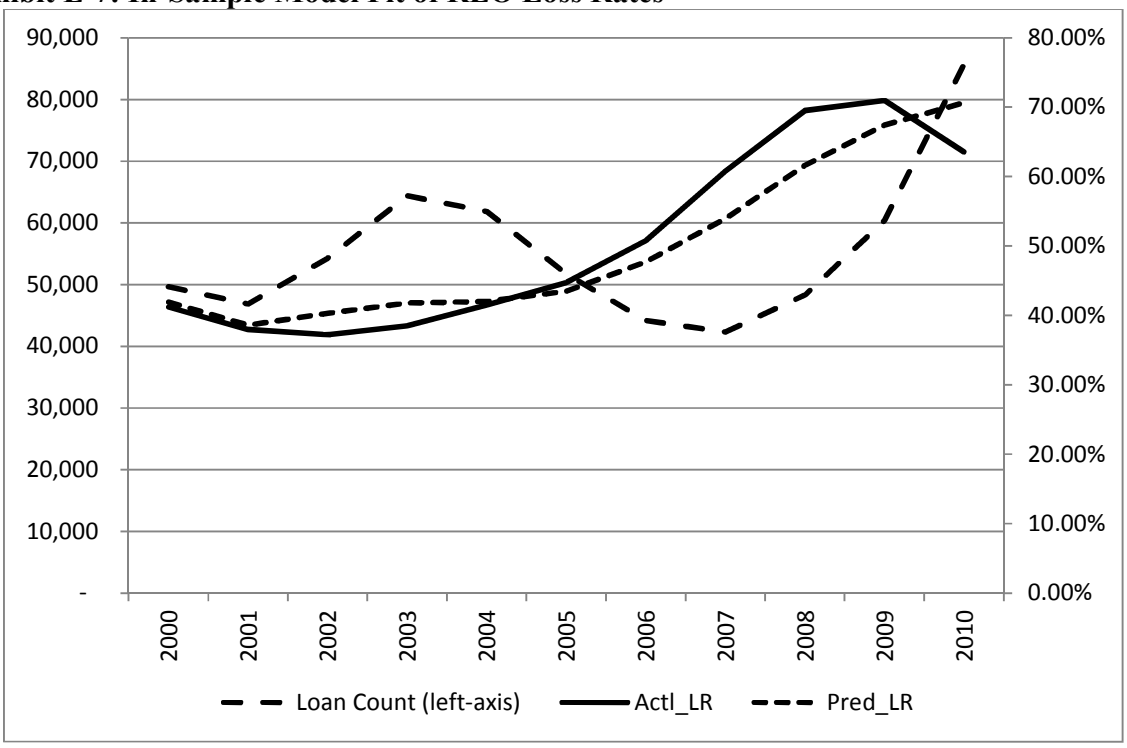
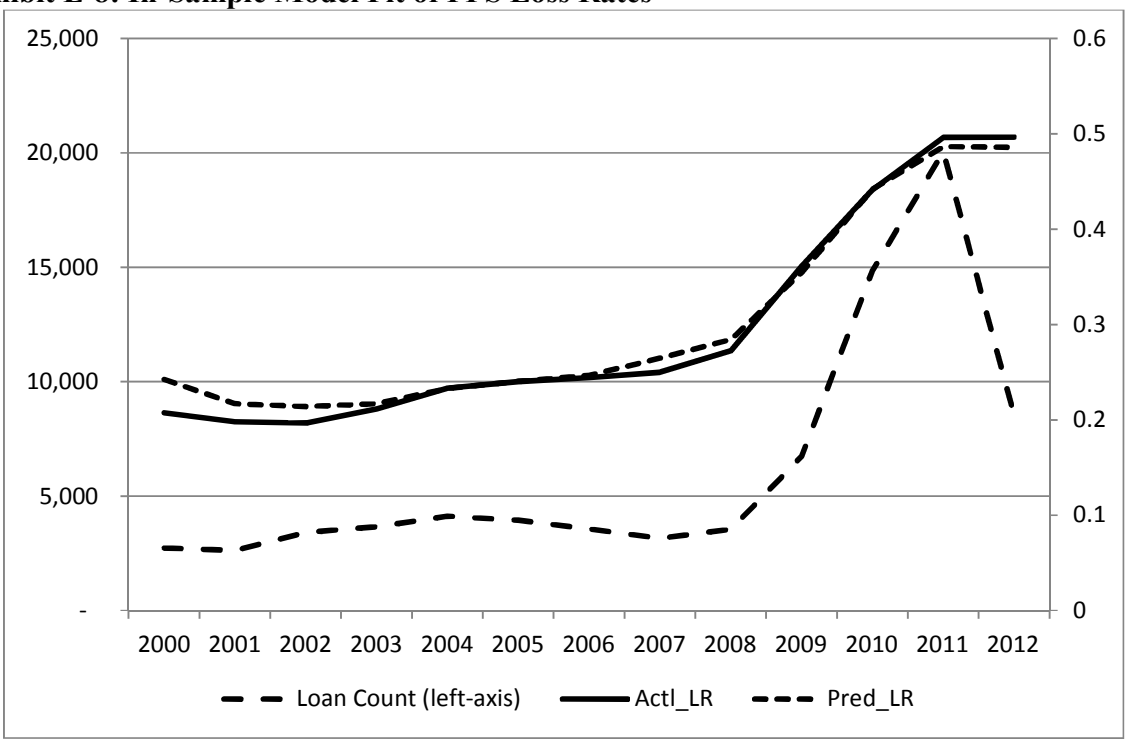


Exhibit E-8: In-Sample Model Fit of PFS Loss Rates



Appendix F
FHA Volume Model

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Appendix F: FHA Volume Model

Prior to the 2010 Actuarial Review (AR), the ARs had relied on HUD estimates of the future FHA mortgage volumes. Since then, we have developed and used an FHA mortgage volume model in order to project future FHA loan volumes that are sensitive to alternative economic scenarios.

Our FHA volume model specification has three stages: first, we specify mortgage market dollar volumes separately for purchase and refinance loans at the national level, excluding home equity loans and second liens; next, we estimate the share of FHA fully-underwritten refinance volume as a specified share of the national refinance volume. And last, we project the FHA streamlined refinances (SR) volumes based on termination prediction in dollar amount for loans that are prepaid into FHA mortgages in a quarter before.

In our model, the national purchase volume responds to house prices and prior volume amounts, while the national refinance volume responds to house prices and mortgage and Treasury interest rates. The FHA fully underwritten refinance volume, stated as a share of the national refinance volume, is a function of its lagged value and mortgage and Treasury interest rates.

This year the FHA streamline refinance (SR) volume is projected with the newly introduced loan-level transition equation to SR refinance (as described in Appendix A), so we no longer need a macro-model like we used last year.
The FHA purchase volume is derived from the national purchase volume based on an assumed share. The forecasted share starts out at the observed CY2012Q1 purchase share of 30 percent (historically much above average) and is reduced in steps the further out the projection. The FHA share of the purchase market ends up in FY2019 at 20 percent, twice as high as the historical average share of around 10 percent. The 20 percent long-term market share is provided by FHA according to its projection of future government policies and the private mortgage market roles. If the alternatives to FHA lending completely rebound to their historical average within the next few years, FHA market shares will be lower than assumed here. The case for at least some continued impairment of the non-FHA market appears highly warranted given the general economic conditions that prevailed at the time of this Review.

At the time of the model estimation, we used data over CY 1990Q1 through CY 2012Q1.

I. Volume Model Specification

The following defines our notation:

Variables:
V = National Volume ($ millions)
F = FHA Volume ($ millions)
R = Interest Rate
H = National Home Price Index
Q = Quarter Indicator (as 0/1 dummy variables for each quarter)
T = 1 after CY 2006; 0 otherwise

Subscripts:
t = time index (quarterly)
k = index for coefficients or quarters

Superscripts:
P = Purchase Mortgages
R = Refinance Mortgages
S = Streamline Refinance Mortgage (FHA)
1 = 1-year Treasury
10 = 10-year Treasury
m = Mortgage

α, β, θ, λ, γ and φ are coefficients to be estimated.

After some experimentation with forms of the dependent and independent variables, lags and variable inclusions, we estimated by Ordinary Least Squares the set of equations shown below:

$$LnV_t^P = \alpha_0 + \sum_{k=1}^{3} \alpha_k Q_k + \sum_{k=1}^{3} \beta_k LnV_{t-k}^P + \varphi\, Ln(H_t / H_{t-4}) \qquad (1)$$

$$LnV_t^R = \alpha_0 + \beta\, LnV_{t-1}^R + \sum_{k=0}^{4} \gamma_k R_{t-k}^m + \lambda(R_t^{10} - R_t^1) + \varphi\, Ln(H_t / H_{t-4}) \qquad (2)$$

$$Ln\frac{F_t^R}{V_t^R} = \alpha_0 + \beta\, Ln\frac{F_{t-1}^R}{V_{t-1}^R} + \sum_{k=0}^{4} \gamma_k R_{t-k}^m + \theta T \qquad (3)$$

Equation (1) says that the nation's volume of purchase-money mortgages is a seasonally adjusted function of its volume last quarter and the yearly house price appreciation (HPA). Equation (2) says that the nation's volume of new refinance mortgages is a function of its lagged volume,

mortgage rates over the last four quarters, the spread between the 10- and 1-year Treasury rates and yearly HPA. The dependent variable for the third equation has as its numerator FHA's volume of fully underwritten refinance mortgages. As mentioned above, the transition equations include a transition to SR mortgages, so there is no need to have a macro-model projection any longer. So the third equation says that the share of FHA's non-SR volume of the nation's refinance mortgages is a function of its lagged value, the last four quarter's mortgage rates and whether the date is after CY2006.

II. Historical Data

When estimating the volume model, we used historical data from public sources as well as the FHA data warehouse as of June 2012. Exhibit F-1 details the data sources.

Exhibit F-1: Sources and Description of Variables

Variables	Source	Description
1-year Treasury rate	economy.com	1-Yr Constant Maturity Securities
10-year Treasury rate	economy.com	10-Yr Constant Maturity Securities
Mortgage rate	economy.com	Mortgage Rates Primary Market: 30-Year Commitment Rate - Fixed Rate, National
House Price Index	economy.com	FHFA All Transactions Home Price Index (1980Q1 = 100), National
Market originations	MBA[a]	National Mortgage Origination, Purchase and Refinance, 1-4 Family, March 2012
FHA originations	FHA data warehouse	FHA loans separated into purchase, SR, refinance

[a] Mortgage Bankers Association, http://www.mbaa.org/ResearchandForecasts/ForecastsandCompentary

III. Regression Results

Exhibits F-2 through F-4 provide the details of the regression results for Equations (1) – (3), respectively. Exhibits F-5 through F-7 are charts of the respective in-sample fits. Note that the third chart shows the volume of FHA fully underwritten refinance volume, which is obtained from the numerator of Equation (3). We retained several statistically insignificant coefficients to show more general model specifications and to make the model forecasts more sensitive to Moody's macroeconomic scenarios.

Exhibit F-2: Ln(National Purchase Dollar Volume) Regression [Equation (1)]

Variable Name	Coefficient	t-statistic	Pr > | t |
Ln(National Purchase Volume), lagged 1 qtr	0.4962	4.52	<.0001
Ln(National Purchase Volume), lagged 2 qtr	0.1169	0.95	0.3436
Ln(National Purchase Volume), lagged 3 qtr	0.2701	2.58	0.0119
Ln (Home Price at t / Home Price t-4)	1.7014	4.35	<.0001
Jan, Feb, Mar	-0.1314	-2.41	0.0182
Apr, May, June	0.2601	3.97	0.0002
July, Aug, Sept	0.1585	2.65	0.0099
Intercept	1.2896	2.92	0.0045
Number of observations = 86 Adj R-Sq = 0.9314 Durbin-Watson Statistic = 2.031			

Exhibit F-3: Ln(National Refinance Dollar Volume) Regression [Equation (2)]

Variable Name	Coefficient	t-statistic	Pr > | t |
Ln(National Refi Volume), lagged 1 qtr	0.8243	15.20	<.0001
Mortgage rate at t	-0.5901	-8.00	<.0001
Mortgage rate, lagged 1 quarter	-0.1910	-1.65	0.1024
Mortgage rate, lagged 2 quarters	0.8276	7.11	<.0001
Mortgage rate, lagged 3 quarters	-0.3004	-2.72	0.0080
Mortgage rate, lagged 4 quarters	0.1548	2.09	0.0397
Spread between 10-Yr and 1-Yr	-0.0277	-1.02	0.3088
Ln (Home Price at t / Home Price t - 4)	2.5190	3.29	0.0015
Intercept	2.6751	3.13	0.0025
Number of observations = 88 Adj R-Sq = 0.9525 Durbin-Watson Statistic = 2.479			

Exhibit F-4: Ln(FHA Fully Underwritten Refinance (FUWR) Volume /National Market Refinance Volume) Regression [Equation (3)]

Variable Name	Coefficient	t-statistic	Pr > | t |
Ln(FHA FUWR Volume/Market Refi Vol), lagged 1 qtr	0.9046	22.90	<.0001
Mortgage rate at t	0.5256	4.44	<.0001
Mortgage rate, lagged 1 quarter	-0.4504	-2.55	0.0126
Mortgage rate, lagged 2 quarters	-0.2997	-1.70	0.0935
Mortgage rate, lagged 3 quarters	0.3174	1.83	0.0705
Mortgage rate, lagged 4 quarters	-0.0510	-0.45	0.6523
Dummy = 1 if >= CY 2007	0.3305	2.67	0.0091
Intercept	-0.7487	-2.81	0.0063
Number of observations = 88 Adj R-Sq = 0.9496 Durbin-Watson Statistic = 1.801			

IV. In-Sample Fit

Exhibit F-5: National Purchase Volume In-Sample Fit ($ millions)

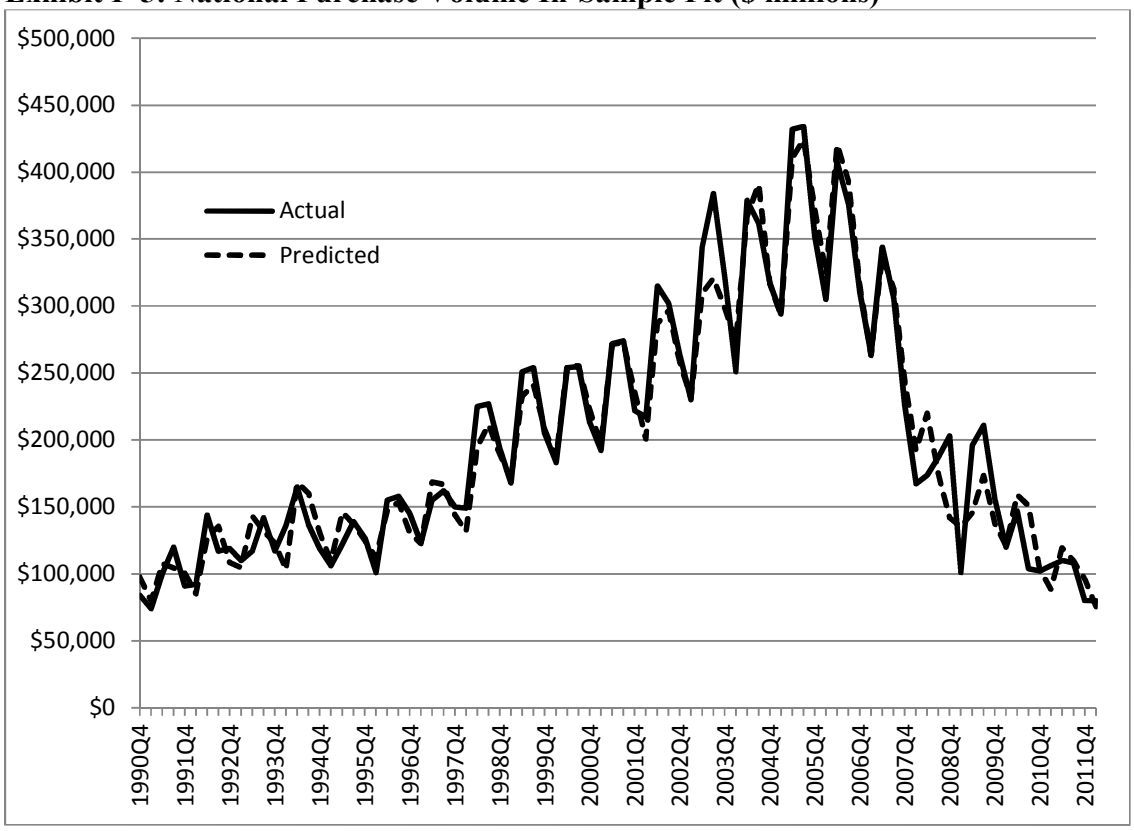


Exhibit F-6: National Refinance Volume In-Sample Fit ($ millions)

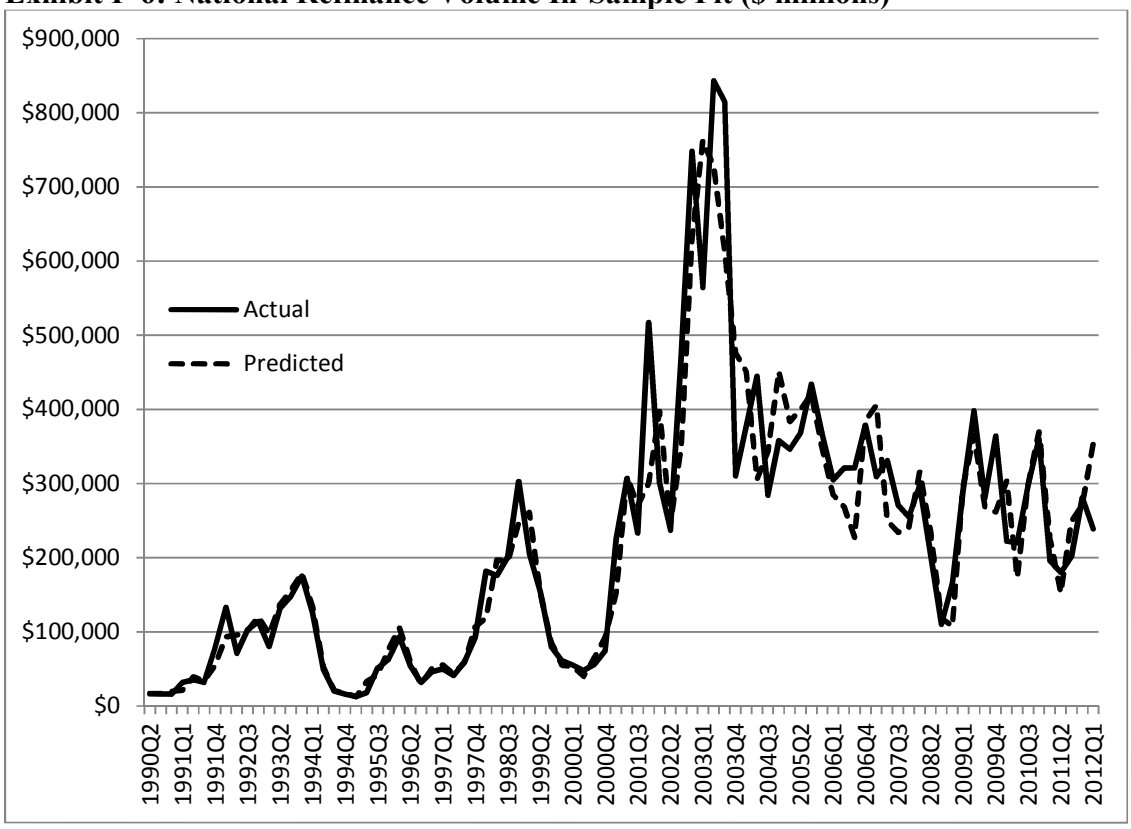
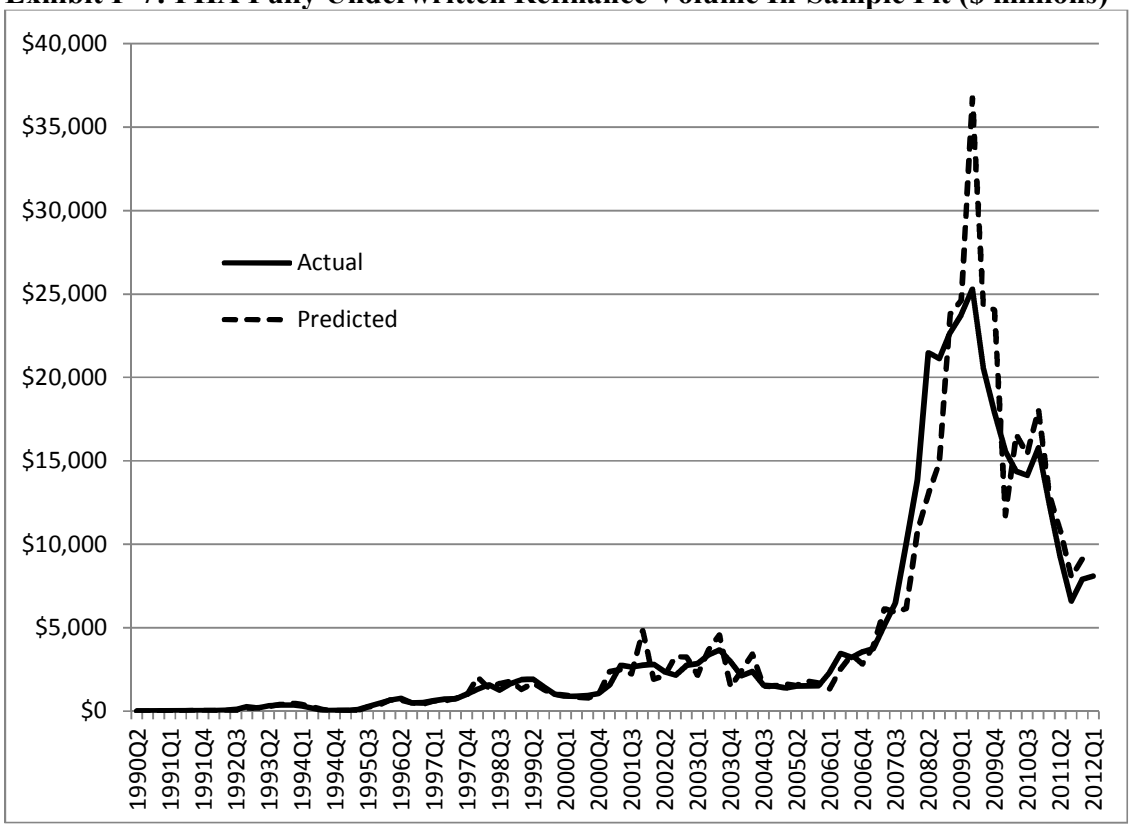


Exhibit F-7: FHA Fully Underwritten Refinance Volume In-Sample Fit ($ millions)



V. Model Adjustments

Model adjustments were necessary to derive the dollar forecasts. In the fully underwritten refinance share equation, we used a dummy variable for calendar years ≥ 2007 to capture the post-subprime regime shift that greatly increased FHA volumes. For the projections, we assume the estimated dummy coefficient declines as follows:

Calendar Year 2012: remains at 0.3305
Calendar Years 2013-2014: 0.2644 (80% of the estimated coefficient)
Calendar Years 2015-2019: 0.1983 (60% of the estimated coefficient)

These assumptions reflect a return to relative market normalcy but with a continued elevated level of FHA refinance market share.

The forecasted value of the fully underwritten refinance dollar volume follows from equations (2) and (3):

$$F_t^R = \exp(Ln\frac{F_t^R}{V_t^R}) * \exp(LnV_t^R) \quad (4)$$

where the right-hand sides of the estimated equations (3) and (2), respectively, are substituted into the first two terms on the RHS of this Equation (4).

Another adjustment is that we capped FHA's non-SR volume at 70% of predicted FHA fully-underwritten purchase volume through FY2012Q2 to FY2019. The reason is that simulated stochastic paths would cause large deviation of FHA's non-SR volume and some of them are even higher than FHA fully-underwritten purchase volume, while we only observe maximum refinance volume that is 65% of purchase volume in history.

Lastly, the forecasted dollar volume of the FHA dollar purchase volume follows from Equation 1 and assumptions regarding FHA's share of the national purchase market:

$$F_t^P = \exp(LnV_t^P) * \textit{ Assumed Share in Fiscal Year} \quad (5)$$

According to FHA's projection, the FHA purchase shares are assumed to follow the pattern shown in Exhibit F-8.

Exhibit F-8: Assumed FHA Purchase Volume Share

Fiscal Years	FHA Purchase Volume Share of National Purchase Volume
2012-2013	30%
2014	28%
2015	26%
2016	23%
2017-2019	20%

As with the refinance market, FHA's share of the purchase market is assumed to slowly decline from its post-subprime heights, but the future FHA purchase share remains twice as high as the historical long-run average of around 10 percent.

Based on Moody's baseline scenario, the predicted product volumes were shown in Appendix C, Exhibit C-1. The refinance volumes decline sharply in response to Moody's forecasted rapid rise in interest rates, resulting in some temporal variability in the product volumes and their relative

shares. Note that with this demand model, we have made the volume projections, by type, endogenous, responding to alternative economic scenarios.

Appendix G

Stochastic Processes of Economic Variables

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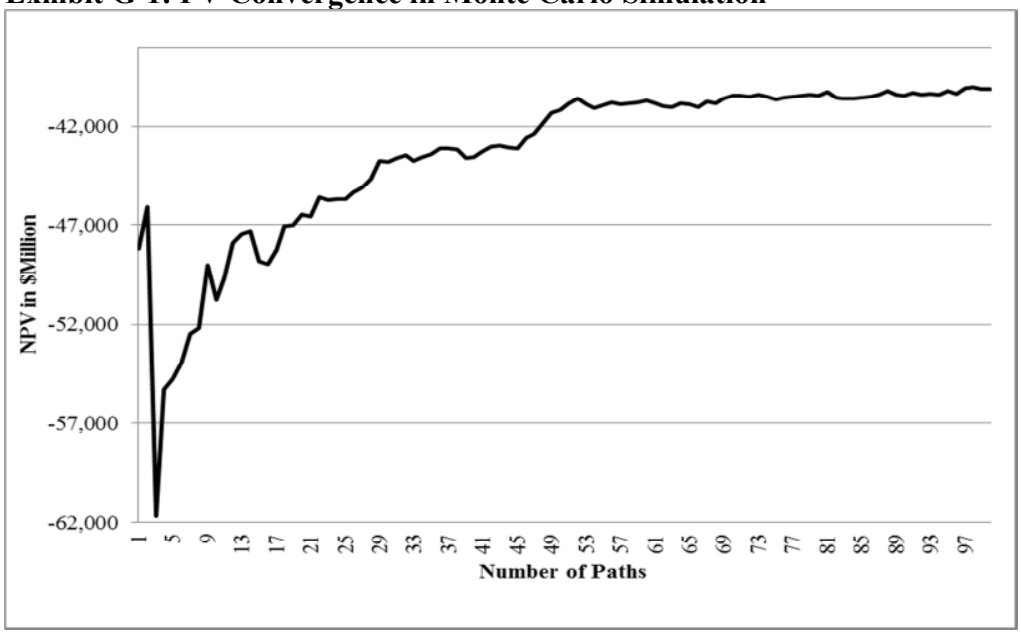
Appendix G: Stochastic Processes of Economic Variables

This appendix describes the stochastic processes assumed for the economic variables used in the Monte Carlo simulations of the FHA Actuarial Review 2012. In past Reviews, the Economic Value of the MMIF was estimated by computing the present value (PV) of the extant portfolio's future cash flows along the single expected path of house price appreciation (HPA) and interest rates. In this year's Review, we apply the interpretation of the expected present value as the present value of expected cash flows from a wide variety of possible paths of HPA and interest rates. This interpretation is consistent with the industry best practice for pricing and measuring risks of mortgage portfolios. The concept is to project a number of equally likely paths of HPA and interest rates, compute the PV of the projected cash flows for each path and, since each path is equally likely, compute the average PV over all the paths as the expected present value. We are then able to estimate the probability of a given economic scenario occurring, including in the tail of the distribution. The latter methodology is presented in the final subsection of this appendix.

We selected 100 simulated paths for the Monte Carlo simulations because we observed that the present value of the future cash flows converged to a constant value by the use of 100 paths. This converged value is the expected net present value of future cash flows. We obtain the economic value of the Fund by adding this expected net present value to the capital resources. Any more paths would increase the computer time required to conduct simulations with no measurable benefit. Exhibit G-1 shows the convergence of the Monte Carlo simulation - after about the 75^{th} path the PV of future cash flows does not change measurably.

Exhibit G-1: PV Convergence in Monte Carlo Simulation



The economic variables modeled herein as stochastic processes to compute this Expected Value includes:

- 1-year Treasury rates,
- 10-year Treasury rates,
- 30-year fixed rate mortgage (FRM) rates,
- FHFA national house price index (HPI), and
- Unemployment rates.

These stochastic processes were modeled using the "real world" or "physical" measure and hence estimated using historical data.[38] This approach is appropriate for the Actuarial Review because the simulated rates are designed to approximate the actual future values. Since all status transition probability models were estimated using the historically observed interest rate and house price appreciation rates, estimating interest rates and other economic variables using the real-world measure is consistent with this approach.

[38] For valuing options, "theoretical" or "risk-neutral" future paths of interest rates are developed that permit estimation of option values based on observed option prices and the prices of the underlying asset upon which the options are based. These paths do not have any resemblance to historical movements in interest rates.

I. Historical Data

A. Interest Rates

With the high inflation rate caused by the global oil crisis in the late 1970's, interest rates rose to an historical high. Since then, the Federal government shifted its monetary policy from managing interest rates to managing the money supply. Interest rates generally decreased since this policy shift. Exhibit G-2 shows historical interest rates since 1953. The 1-year Treasury rate was around 2% in 1953 and increased steadily to its peak of 16.32% in 1981 Q1. After that, it followed a decreasing trend and reached an all-time low of 0.11% in 2011 Q4.

Exhibit G-2: Historical Interest Rates

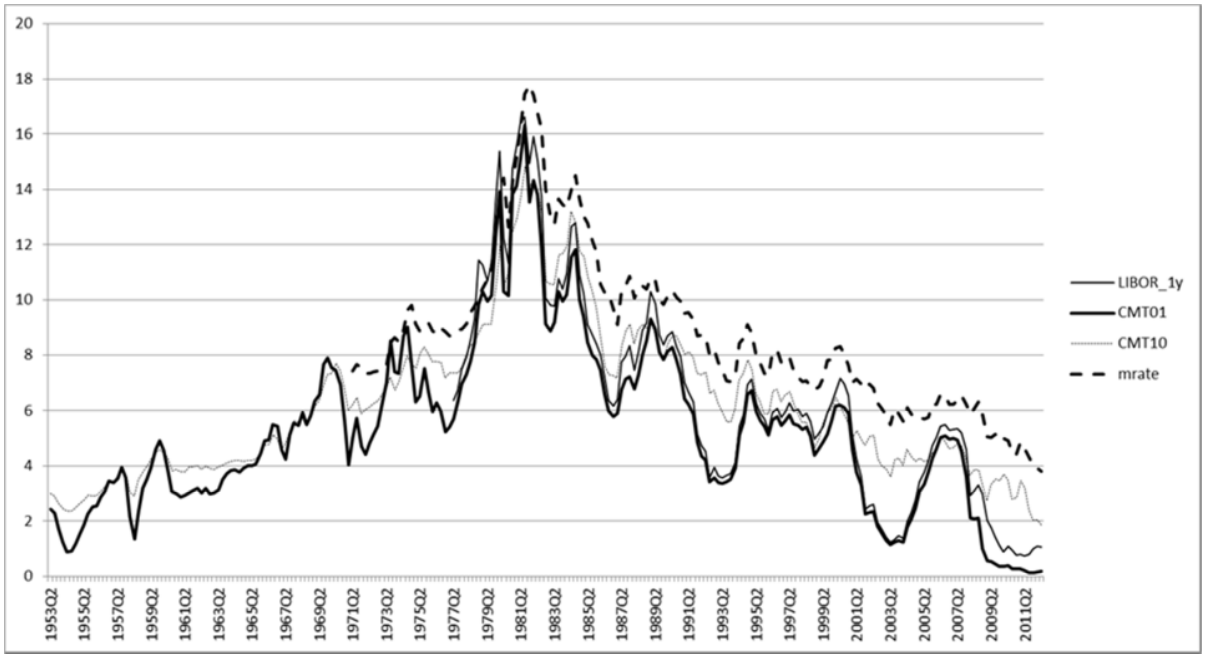
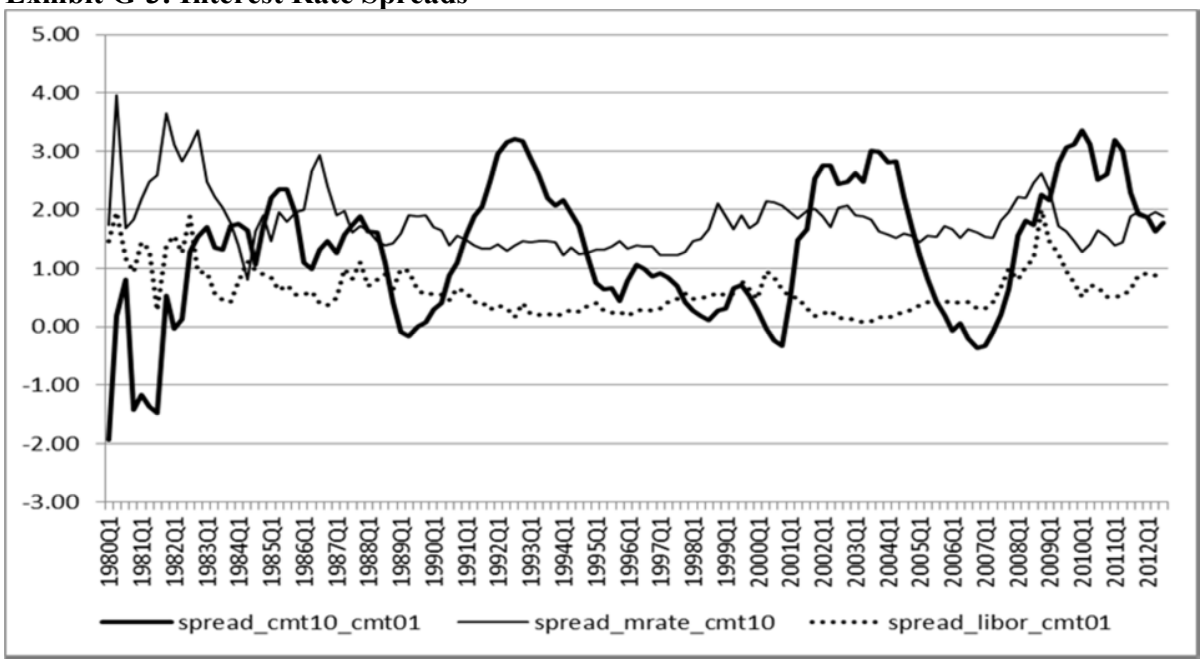


Exhibit G-3 shows historical interest rate spreads, including the spread between the 10-year and the 1-year Treasury rate, the spread between the 30-year mortgage rate and the 10-year Treasury rate, and the spread between the 1-year LIBOR and the 1-year Treasury rate. The spread between the 10-year and 1-year Treasury rates appears to be a mean-reverting process and the spread is not always positive. However, the spread of the mortgage rate over the 10-year Treasury rate and the spread of LIBOR over the 1-year Treasury rate are always positive, reflecting the premium for credit risk.

Exhibit G-3: Interest Rate Spreads



B. House Price Appreciation Rates

The national house price appreciation rate (HPA) is derived from FHFA repeat sales house price indexes (HPIs) of all transactions. Due to methodological limits and the thin data at the beginning of the sample period, HPIs prior to 1980 tend to be unreliable indicators of the actual appreciation rate. We used the HPI data from 1980 Q1 through 2012 Q1 to build our model. The HPA series being modeled is defined as

$$HPA_t = \ln\left(\frac{HPI_t}{HPI_{t-1}}\right)$$

Exhibit G-4 shows the National HPI and quarterly HPA from 1980 Q1 to 2012 Q1. The long-term average quarterly HPA is around 1.00%.

The HPI increased steadily before 2004, and the quarterly appreciation rate was around 1.15%, close to the long-term average. Then house prices rose sharply starting from around 2004. The average quarterly house price appreciation rate was 2.09% during the subprime mortgage expansion period, from 2004 to 2006, and reached the peak of 3.61% in 2004 Q3. After 2006, the average growth rate became negative. Exhibit G-5 shows the average quarterly HPA (by annual rates) by selected historical time periods.

Exhibit G-4: National HPI and HPA

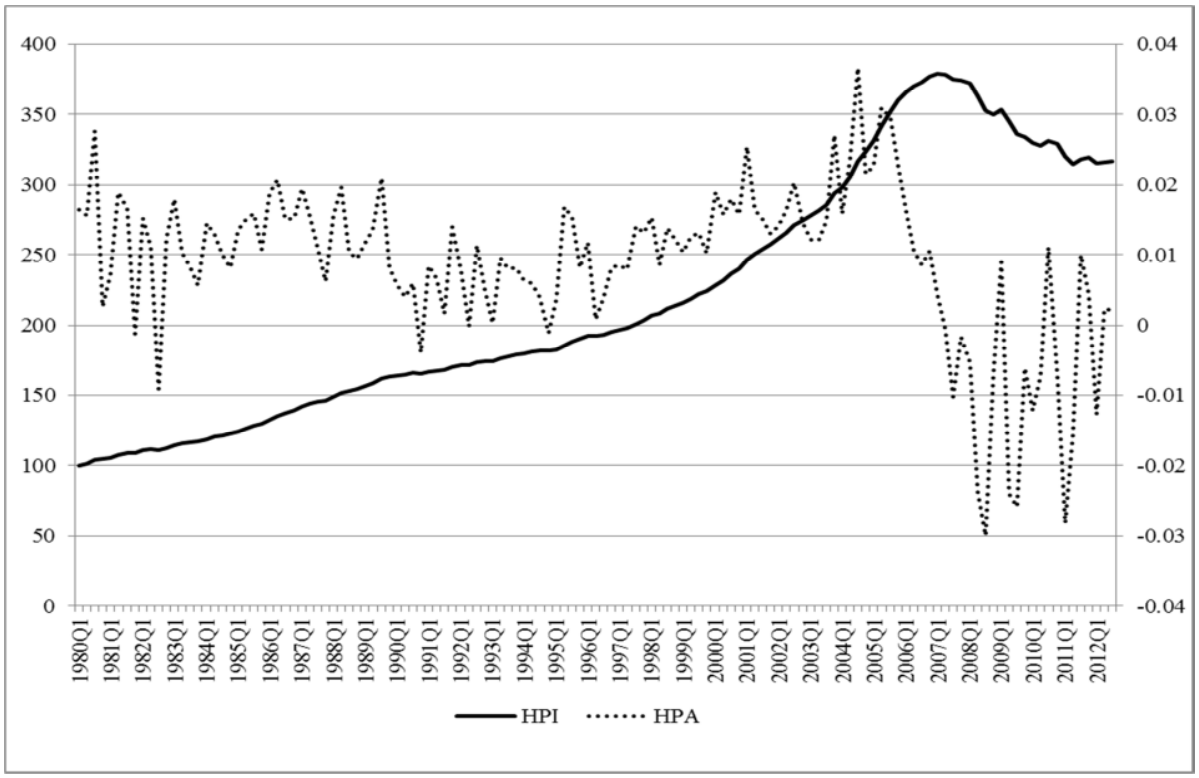


Exhibit G-5: Average Quarterly HPA by Time Span

Period	Average Quarterly HPA
1980 – 2010	1.00%
1980 – 2003	1.15%
2004 – 2006	2.09%
2007 – 2010	-0.69%

II. 1-Year Treasury Rate

In this section, we present selected historical statistics on the one-year Treasury rate, describe the model we used in our simulations, and finally report the parameter estimates and their standard errors.

Exhibit G-6 shows the summary statistics of the historical 1-year Treasury rates for two periods: one from 1953 and the other from 1980.

Exhibit G-6: Statistics for the 1-Year Treasury Rates

Statistics	Since 1980	Since 1953
Mean	5.59%	5.29%
Standard Deviation	3.67%	3.13%
Max	16.32%	16.32%
95- Percentile	13.55%	10.15%
90- Percentile	10.18%	8.86%
50- Percentile	5.41%	4.99%
10- Percentile	0.52%	1.30%
5- Percentile	0.26%	0.38%
Min	0.11%	0.11%

We used a GARCH(1,1) parameterization to model the 1-Year Treasury rate (r_1) and estimated it using data from 1980 Q1 to 2012 Q1. The process takes the following form:

$$r_{1,t} = A + B * r_{1,t-1} + \sigma_t dZ_1 \quad (1)$$

where Z is the independent Wiener random process with distribution N(0,1).

and where the variance (σ) of the residual term follows a GARCH(1,1) process:

$$\sigma_t{}^2 = \beta_0 + \beta_1 \varepsilon_{t-1}^2 + \beta_2 \sigma_{t-1}^2 \quad (2)$$

where ε is the error term, which equals $\sigma_t dZ_1$ from equation (1)

Full information maximum likelihood (FIML) method is used to estimate the parameters in equations 1 and 2. The estimated results are presented in Exhibit G-7.

Exhibit G-7: Estimation Results for 1-Year Treasury Rate Model

Parameter	Estimate	Std Dev	tValue	Prob>t
A[39]	(0.0002)			
B	0.993	0.020	0.339	0.735
β_0	3.65E-06	2.13E-06	1.701	0.089
β_1	0.417	0.199	2.097	0.038
β_2	0.549	0.122	4.482	1.67E-05
Adjusted R2	0.9501			

The model based on these parameters is used to simulate FY2013 Q1 and future 1-year Treasury rates.

The constant terms are used to calibrate the series such that the median value among 100 simulations matches Moody's July 2012 baseline forecast of the 1-year Treasury rates quarter by quarter. However, Moody's July forecast only covers the period until 2042 Q4. After 2043, we repeated Moody's last 4-quarter forecasts for all remaining quarters. All the other interest rates and HPA series are expanded to the year 2080 using the same methodology. A lower bound of 0.01 percent was applied to the simulated future rates to avoid negative rates in the simulation.

III. 10-Year Treasury Rate

The 10-year Treasury rate is modeled by adding a stochastic spread term to the 1-year rate. We estimate the dynamics of the spread between 10-year Treasury rate and 1-year Treasury rate from the historical data. The spread term is assumed to depend on the one-year rate and the lagged value of the spread term and a random component. The model for the spread is

$$s_{10,t} = \alpha_{10,t} + \beta_{10} r_{1,t} + \gamma_{10} s_{10,t-1} + \varepsilon_{10,t} \quad (3)$$

where $s_{10,t}$ is the spread between the 10-year and 1-year Treasury rates and $r_{1,t}$ is 1-year Treasury rate. The variance of the residual term follows an ARCH (1) process:

$$\sigma_t{}^2 = \beta_0 + \beta_1 \varepsilon_{t-1}^2 \quad (4)$$

FIML is used to estimate the parameters α_{10} and β_{10}. The estimated parameters are shown in Exhibit G-8.

[39] The interception term A is calibrated each time period, so that the median of our simulated paths match the baseline scenario from Moody's forecast as of July 2012.

Exhibit G-8: Estimation Results for 10-Year Treasury Rate Spread Model

Parameter	Estimate	Std Dev	tValue	Prob>t
$\alpha_{10,t}$[40]	(0.004)			
β_{10}	-0.022	0.017	-1.296	0.197
γ_{10}	0.840	0.048	17.511	3.33E-35
β_0	1.39E-05	3.67E-06	3.772	0.000
β_1	0.530	0.345	1.536	0.127
Adjusted R2	0.8277			

We used the estimated parameters to simulate the spread between the 10-year and 1-year Treasury rates, and added the simulated spread to the simulated 1-year Treasury rate. Then we adjusted the constant term $\alpha_{10,t}$ to calibrate the series such that the median value among 100 simulated paths matched Moody's July 2012 base forecast of the 10-year Treasury rates quarter by quarter (with the same logic of expanding the forecast series to year 2080). We also set a floor value at 0.01 percent to the simulated 10-year Treasury rates.

IV. Mortgage Rate

We modelled the mortgage rate by first modelling the spread between the mortgage rate and the 10-year Treasury rate and then adding the spread back to the 10-year rate. The process for the spread is assumed to be:

$$s_{m,t} = \alpha_{m,t} + \beta_{1m} r_{1,t} + \beta_{2m} r_{1,t-1} + \beta_{3m} s_{10,t} + \beta_{4m} s_{m,t-1} + \varepsilon_{m,t} \quad (5)$$

where $s_{m,t}$ is the spread between the mortgage rate and 10-year Treasury rate, $r_{1,t}$ is 1-year Treasury rate, and $s_{10,t}$ is the spread between the 10-year and 1-year Treasury rate. The variance of the residual term follows a GARCH (1,1) process:

$$\sigma_t{}^2 = \beta_0 + \beta_1 \varepsilon_{m,t-1}^2 + \beta_2 \sigma_{t-1}^2 \quad (6)$$

FIML is used to estimate the parameters in equations (5) and (6). The estimated parameters are shown in Exhibit G-9.

[40] The intercept term is calibrated each time period so that the median simulated spread matches Moody's baseline forecast.

Exhibit G-9: Estimation Results for the Mortgage to 10-Year Treasury Rate Spread Model

Parameter	Estimate	Std Dev	tValue	Prob>t
$\alpha_{m,t}$[41]	(0.005)			
β_{1m}	-0.179	0.032	-5.666	1.02E-07
β_{2m}	0.169	0.031	5.471	2.49E-07
β_{3m}	-0.053	0.018	-2.995	0.003
β_{4m}	0.742	0.050	14.695	1.35E-28
β_0	2.35E-07	1.29E-07	1.821	0.071
β_1	0.128	0.064	1.988	0.049
β_2	0.795	0.067	11.931	4.08E-22
Adjusted R2	0.6047			

We used the estimated parameters to simulate the spread between the mortgage rate and the 10-year Treasury rates, and added the simulated spread to the simulated 10-year Treasury rate to obtain the mortgage rate. Then we adjusted the constant term $\alpha_{m,t}$ to calibrate the series such that the median value among 100 simulated paths matched Moody's July 2012 base forecast of the mortgage rates quarter by quarter. As with the other interest rates, we also set a floor value at 0.01 percent to the simulated mortgage rate.

V. House Price Appreciation Rate (HPA)

A. National HPA

We specified the national HPA to depend on its own lags, seasonal dummy variables, the level of short rates and on various spreads and their lags. After considerable experimentation, the model we adopted was:

$$HPA_t = \mu_t + \alpha_1 D_{spring} + \alpha_2 D_{summer} + \alpha_3 D_{fall} + \beta_1 HPA_{t-1} + \beta_2 HPA_{t-2} + \beta_3 HPA_{t-3} + \beta_4 r_{1,t} + \beta_5 r_{1,t-1} + \beta_6 s_{10,t} + \beta_7 s_{10,t-1} + \beta_8 s_{m,t} + \beta_9 s_{m,t-1} + \sigma_{h,t} dZ_h \quad (7)$$

where, $r_{1,t}$ is the 1-year Treasury rate,
$s_{10,t}$ is the spread between the 10-year and 1-year Treasury rates,
$s_{m,t}$ is the spread between mortgage rate and 10-year Treasury rate, and
Z is the independent Wiener random process with distribution N(0,1)

The variance of the residual term follows an ARCH (1) process:

[41] The intercept term is calibrated each time period so that the median of the simulated spread matches Moody's baseline forecast.

$$\sigma_{h,t}{}^2 = \gamma_0 + \gamma_1 \varepsilon_{t-1}^2 \quad (8)$$

The lags and variable inclusions were determined by achieving appropriate coefficient signs and significance, and overall model fit. FIML was used to estimate parameters in equations (7) and (8). The results are shown in Exhibit G-10.

Exhibit G-10: Estimation Results the National HPA Model

Parameter	Estimate	Std Dev	tValue	Prob>t
μ_t	(-0.001)	Matched with Moody's Forecast		
α_1	0.005	0.001	4.033	0.000
α_2	0.005	0.001	4.405	2.45E-05
α_3	0.005	0.001	5.196	9.34E-07
β_1	0.613	0.058	10.610	1.4E-18
β_2	-0.153	0.060	-2.534	0.012677
β_3	0.398	0.046	8.606	5.63E-14
β_4	-0.596	0.089	-6.737	7.49E-10
β_5	0.600	0.088	6.836	4.62E-10
β_6	-0.770	0.142	-5.427	3.4E-07
β_7	0.748	0.143	5.243	7.63E-07
β_8	-0.649	0.177	-3.656	0.000
β_9	0.581	0.160	3.633	0.000
γ_0	1.2E-05	3.19E-06	3.759	0.000
γ_1	0.955	0.264	3.619	0.000
Adjusted R2	0.6242			

We used these parameters to simulate future HPAs from 2012 Q2. Also, we calibrated the mean of HPA (μ_t in the equation) by matching the median value across 100 simulated paths to Moody's July base forecast. Moody's July forecast extends only to year 2042 Q4, so again we repeat the last four quarters for the remaining terms.

B. Geographic dispersion

The MSA-level HPA forecasts were based on Moody's forecast of local and the national HPA forecasts. Specifically, at each time *t*, there is a dispersion of HPAs between the i^{th} MSA and the national forecast:

$$Disp_{i,t}^{Base} = (HPA_{i,t}^{Base} - HPA_{national,t}^{Base})$$

This dispersion forecast under Moody's base case was preserved for all local house price forecasts under individual future economic paths. That is, for economic path *j*, the HPA of the i^{th} MSA at time t was computed as:

$$HPA_{i,t}^{j} = (HPA_{national,t}^{j} + DISP_{i,t}^{Base})$$

This approach retains the relative current housing market cycle among different geographic locations and it allows us to capture the geographical concentration of FHA's current endorsement portfolio. This approach is also consistent with Moody's logic in creating local market HPA forecasts relative to the national HPA forecast under alternative economic scenario forecasts.[42] We understand this approach is equivalent to assuming perfect correlation of dispersions among different locations across simulated national HPA paths, which creates a systematic house price decrease during economic downturns and vice versa during booms. Due to Jensen's Inequality, this tends to generate a more conservative estimate of claim losses of the Fund.

VI. Unemployment Rate

A. National Unemployment Rate

This year's Review added the unemployment rate in the transition model, so we need to simulate future unemployment rates from 2012 Q2. Based on our analysis, the unemployment rate depends on the prior unemployment rate, house prices, and mortgage and Treasury rates.

We used quarterly data from CY 1975 to CY 2011 to estimate unemployment rate at the national level. The model we adopted was:

$$ue_t = \mu_t + \beta_1 ue_{t-1} + \beta_2 ue_{t-2} + \beta_4 r_{1,t} + \beta_5 r_{m,t} + \beta_6 HPA_t \qquad (9)$$

where, $r_{1,t}$ is the 1-year Treasury rate,
$r_{m,t}$ is the 30-year mortgage rate,
HPA_t is the annual house price growth rate at national level,
ue_t is the unemployment rate

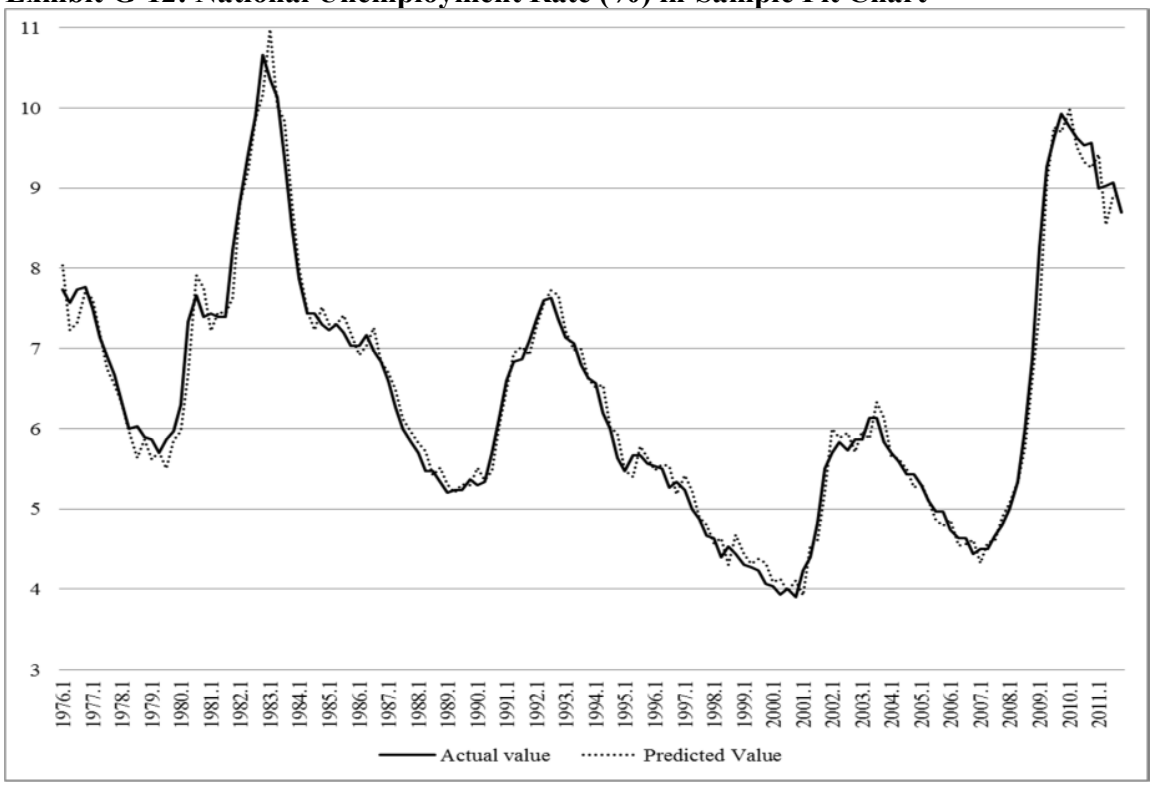
[42] The dispersion of each MSA remains constant among all alternative Moody's forecast scenarios.

Exhibit G-11: Estimation Results for the National Unemployment Rate Model

Variable	Parameter Estimate	Standard Dev	t Value	Pr > |t|
Intercept	0.18657	0.10164	1.84	0.0686
unemployment rate, lag1	1.52026	0.06638	22.9	<.0001
unemployment rate, lag2	-0.60137	0.06266	-9.6	<.0001
National annual house price growth rate at time t	-1.45474	0.54388	-2.67	0.0084
1-year Treasury rate at time t	-0.05362	0.02093	-2.56	0.0115
30-year mortgage rate at time t	0.08098	0.02463	3.29	0.0013
Adj R-Sq = 0.9801 Durbin-Watson Statistic = 2.039				

From the simulated interest rates and house prices, we applied the parameters above to calculate the corresponding national unemployment rate. Based on historical statistics, the national unemployment rate was capped at 20% with a floor at 2%.

Exhibit G-12: National Unemployment Rate (%) in-Sample Fit Chart



B. Geographic dispersion

Following the same logic that we applied to the MSA-level HPA forecasts, we first obtained the dispersion of unemployment rates between the i^{th} MSA level and the national level from Moody's July base-case forecast at each time *t*:

$$Disp_{i,t}^{Base} = (ue_{i,t}^{Base} - ue_{national,t}^{Base})$$

This dispersion forecast was preserved for all local unemployment rate forecasts under each individual future economic path. That is, for economic path *j*, the unemployment rate of the i^{th} MSA at time t was computed as:

$$ue_{i,t}^{j} = (ue_{national,t}^{j} + DISP_{i,t}^{Base})$$

In the end, we capped the unemployment rate at local level at 30% with a floor at 1%.

VII. Effect of Changing from Deterministic to Stochastic Estimation

If the PV-generating function is "concave," meaning that when the separate PVs are arranged from lowest to highest, they increase at a decreasing rate, then the expected PV (the average of the individual-path PVs) will be less than the single PV computed for the expected path. (This is known as "Jensen's Inequality.") For mortgages, the PV-generating function is typically concave with respect to HPA, because when HPA goes negative, default losses increase at an increasing rate as HPA falls, but when HPA goes positive and keeps increasing, default losses can only go as low as zero and premium income does not increase measurably. This is particularly true along the house price growth rate dimension, which impacts the CLTV of a loan.

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Appendix H

Econometric Results

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Conditional Claim Rates All Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1983	0.01	0.44	1.47	2.14	3.39	5.08	4.44	3.12	2.50	2.30	2.03	2.06	1.71	1.17	1.07	0.94	0.73	0.47	0.39	0.21	0.23	0.17	0.10	0.08	0.05	0.05	0.03	0.04	0.02	**0.04**
1984	0.03	0.96	2.78	4.93	7.30	6.28	4.35	3.27	2.88	2.55	2.52	2.17	1.68	1.58	1.19	1.02	0.80	0.54	0.36	0.27	0.18	0.15	0.12	0.09	0.06	0.08	0.07	0.06	**0.05**	**0.03**
1985	0.02	0.83	3.25	6.00	5.37	4.02	3.38	3.07	3.05	2.97	2.82	2.00	1.93	1.64	1.16	1.21	0.72	0.54	0.38	0.32	0.21	0.15	0.11	0.16	0.15	0.10	0.12	**0.08**	**0.11**	**0.08**
1986	0.01	0.45	1.73	2.18	2.04	1.86	1.67	1.58	1.78	1.85	1.52	1.47	1.26	1.10	0.97	0.64	0.49	0.43	0.42	0.28	0.19	0.20	0.14	0.16	0.20	0.23	**0.14**	**0.17**	**0.11**	**0.02**
1987	0.01	0.35	1.02	1.24	1.27	1.29	1.23	1.40	1.43	1.22	1.24	1.10	0.99	0.85	0.50	0.43	0.43	0.40	0.30	0.20	0.17	0.15	0.24	0.23	0.27	**0.19**	**0.24**	**0.17**	**0.03**	**0.02**
1988	0.01	0.36	1.07	1.50	1.78	1.83	2.26	2.45	2.03	1.98	1.78	1.63	1.38	0.85	0.71	0.65	0.65	0.44	0.39	0.23	0.28	0.30	0.30	0.34	**0.29**	**0.33**	**0.24**	**0.07**	**0.06**	**0.04**
1989	0.01	0.30	1.05	1.61	1.97	2.67	2.95	2.46	2.36	1.96	1.74	1.54	0.96	0.84	0.74	0.72	0.56	0.47	0.35	0.32	0.36	0.47	0.45	**0.45**	**0.44**	**0.24**	**0.10**	**0.09**	**0.06**	**0.03**
1990	0.01	0.29	1.08	1.75	2.57	2.87	2.35	2.40	2.06	1.81	1.55	1.01	0.79	0.76	0.71	0.55	0.48	0.46	0.45	0.39	0.61	0.54	**0.49**	**0.57**	**0.37**	**0.15**	**0.13**	**0.09**	**0.06**	**0.04**
1991	0.01	0.30	1.16	2.04	2.61	2.31	2.47	2.17	1.86	1.66	1.03	0.86	0.77	0.75	0.61	0.46	0.40	0.46	0.45	0.47	0.58	**0.47**	**0.70**	**0.45**	**0.18**	**0.17**	**0.12**	**0.08**	**0.06**	**0.04**
1992	0.00	0.21	0.77	1.26	1.40	1.76	1.70	1.57	1.35	0.90	0.69	0.62	0.57	0.49	0.41	0.31	0.36	0.38	0.37	0.48	**0.57**	**0.86**	**0.50**	**0.24**	**0.25**	**0.18**	**0.14**	**0.11**	**0.08**	**0.07**
1993	0.00	0.16	0.60	0.98	1.47	1.43	1.29	1.07	0.65	0.52	0.48	0.49	0.39	0.32	0.26	0.28	0.32	0.44	0.44	**0.57**	**0.98**	**0.61**	**0.29**	**0.27**	**0.20**	**0.16**	**0.12**	**0.10**	**0.08**	**0.06**
1994	0.00	0.22	0.74	1.32	1.58	1.48	1.14	0.72	0.59	0.53	0.53	0.44	0.35	0.30	0.27	0.35	0.52	0.48	**0.64**	**1.11**	**0.62**	**0.36**	**0.36**	**0.26**	**0.21**	**0.17**	**0.13**	**0.12**	**0.09**	**0.07**
1995	0.01	0.29	1.36	2.29	2.73	2.41	1.71	1.38	1.62	1.50	1.17	0.96	0.78	0.81	0.89	1.18	1.06	**1.17**	**1.90**	**1.08**	**0.59**	**0.59**	**0.44**	**0.33**	**0.26**	**0.19**	**0.16**	**0.12**	**0.09**	**0.07**
1996	0.00	0.31	1.35	2.29	2.31	1.67	1.45	1.63	1.61	1.29	1.04	0.86	0.89	0.94	1.21	1.09	**1.61**	**2.45**	**1.29**	**0.76**	**0.73**	**0.53**	**0.40**	**0.30**	**0.23**	**0.19**	**0.15**	**0.12**	**0.10**	**0.07**
1997	0.01	0.39	1.61	2.38	1.99	2.01	2.27	2.15	1.80	1.42	1.23	1.26	1.25	1.47	1.32	**1.83**	**3.02**	**1.56**	**0.94**	**0.94**	**0.70**	**0.54**	**0.41**	**0.31**	**0.26**	**0.20**	**0.16**	**0.14**	**0.11**	**0.08**
1998	0.01	0.34	1.15	1.28	1.35	1.65	1.83	1.65	1.40	1.14	1.15	1.23	1.52	1.44	**1.99**	**3.38**	**1.68**	**1.09**	**0.99**	**0.69**	**0.51**	**0.38**	**0.28**	**0.22**	**0.18**	**0.14**	**0.11**	**0.09**	**0.07**	**0.05**
1999	0.01	0.32	0.86	1.27	1.85	2.16	1.98	1.57	1.30	1.28	1.37	1.69	1.73	**2.40**	**4.00**	**1.98**	**1.36**	**1.18**	**0.80**	**0.58**	**0.42**	**0.31**	**0.25**	**0.19**	**0.15**	**0.12**	**0.09**	**0.07**	**0.06**	**0.04**
2000	0.01	0.49	1.99	4.05	4.80	4.07	3.32	2.84	2.89	2.76	3.18	2.82	**3.92**	**6.62**	**3.46**	**2.75**	**2.51**	**1.74**	**1.29**	**0.95**	**0.70**	**0.55**	**0.43**	**0.33**	**0.27**	**0.20**	**0.16**	**0.12**	**0.09**	**0.06**
2001	0.01	0.43	1.83	3.61	3.77	3.25	2.75	2.69	2.58	3.16	3.06	**4.30**	**7.26**	**3.61**	**3.00**	**2.60**	**1.73**	**1.28**	**0.93**	**0.68**	**0.54**	**0.42**	**0.31**	**0.25**	**0.19**	**0.15**	**0.11**	**0.08**	**0.06**	**0.04**
2002	0.01	0.47	2.08	2.82	2.67	2.41	2.41	2.44	2.99	2.80	**4.24**	**7.05**	**3.50**	**2.93**	**2.59**	**1.74**	**1.32**	**0.97**	**0.72**	**0.57**	**0.45**	**0.35**	**0.28**	**0.22**	**0.17**	**0.14**	**0.10**	**0.08**	**0.06**	**0.04**
2003	0.01	0.66	1.57	1.76	1.68	1.80	1.94	2.57	2.34	**3.99**	**6.51**	**3.00**	**2.47**	**2.15**	**1.46**	**1.13**	**0.84**	**0.63**	**0.51**	**0.40**	**0.31**	**0.25**	**0.20**	**0.16**	**0.13**	**0.10**	**0.08**	**0.07**	**0.05**	**0.03**
2004	0.12	0.88	1.44	1.69	2.07	2.23	2.78	2.59	**4.43**	**7.18**	**3.29**	**2.72**	**2.40**	**1.64**	**1.29**	**0.97**	**0.73**	**0.58**	**0.47**	**0.36**	**0.29**	**0.23**	**0.19**	**0.15**	**0.12**	**0.10**	**0.08**	**0.06**	**0.05**	**0.03**
2005	0.11	0.76	1.81	2.63	3.21	3.90	3.56	**5.46**	**8.81**	**4.16**	**3.44**	**3.17**	**2.23**	**1.76**	**1.34**	**0.99**	**0.78**	**0.62**	**0.47**	**0.38**	**0.30**	**0.23**	**0.19**	**0.14**	**0.11**	**0.09**	**0.07**	**0.05**	**0.04**	**0.02**
2006	0.02	0.62	2.21	3.71	5.23	4.60	**6.87**	**10.65**	**5.06**	**4.04**	**3.65**	**2.52**	**1.99**	**1.53**	**1.14**	**0.89**	**0.69**	**0.51**	**0.40**	**0.30**	**0.23**	**0.19**	**0.14**	**0.11**	**0.08**	**0.06**	**0.05**	**0.03**	**0.02**	**0.02**
2007	0.02	0.81	3.18	5.78	4.96	**8.71**	**13.84**	**6.68**	**5.02**	**4.41**	**2.99**	**2.32**	**1.80**	**1.37**	**1.08**	**0.84**	**0.63**	**0.49**	**0.37**	**0.28**	**0.22**	**0.17**	**0.13**	**0.10**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.01**
2008	0.01	0.69	3.42	4.14	**7.61**	**12.11**	**6.26**	**4.30**	**3.64**	**2.40**	**1.85**	**1.44**	**1.11**	**0.89**	**0.71**	**0.54**	**0.43**	**0.33**	**0.26**	**0.20**	**0.15**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**
2009	0.01	0.52	1.35	**3.05**	**5.17**	**2.42**	**2.00**	**1.71**	**1.15**	**0.90**	**0.72**	**0.56**	**0.47**	**0.38**	**0.30**	**0.24**	**0.19**	**0.15**	**0.12**	**0.09**	**0.07**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**
2010	0.01	0.23	**1.04**	**2.38**	**1.29**	**1.32**	**1.28**	**0.93**	**0.77**	**0.62**	**0.50**	**0.42**	**0.35**	**0.28**	**0.23**	**0.19**	**0.15**	**0.12**	**0.09**	**0.08**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**
2011	0.01	**0.26**	**1.14**	**0.92**	**1.10**	**1.14**	**0.86**	**0.70**	**0.57**	**0.45**	**0.39**	**0.33**	**0.27**	**0.22**	**0.18**	**0.15**	**0.12**	**0.09**	**0.08**	**0.06**	**0.05**	**0.04**	**0.03**	**0.03**	**0.02**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**
2012	**0.02**	**0.23**	**0.50**	**0.83**	**0.95**	**0.75**	**0.63**	**0.52**	**0.42**	**0.37**	**0.32**	**0.26**	**0.21**	**0.18**	**0.15**	**0.12**	**0.10**	**0.08**	**0.07**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**
2013	**0.01**	**0.19**	**0.95**	**1.53**	**1.32**	**1.12**	**0.91**	**0.75**	**0.68**	**0.59**	**0.50**	**0.42**	**0.35**	**0.30**	**0.26**	**0.21**	**0.17**	**0.15**	**0.12**	**0.11**	**0.09**	**0.07**	**0.06**	**0.05**	**0.04**	**0.03**	**0.03**	**0.02**	**0.02**	**0.01**
2014	**0.01**	**0.29**	**1.39**	**1.83**	**1.77**	**1.54**	**1.33**	**1.25**	**1.10**	**0.95**	**0.84**	**0.71**	**0.61**	**0.53**	**0.44**	**0.38**	**0.33**	**0.27**	**0.24**	**0.20**	**0.16**	**0.14**	**0.11**	**0.09**	**0.07**	**0.06**	**0.05**	**0.03**	**0.03**	**0.02**
2015	**0.01**	**0.31**	**1.18**	**1.71**	**1.67**	**1.54**	**1.49**	**1.34**	**1.22**	**1.08**	**0.92**	**0.82**	**0.73**	**0.60**	**0.52**	**0.45**	**0.38**	**0.34**	**0.28**	**0.22**	**0.20**	**0.16**	**0.13**	**0.11**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**
2016	**0.01**	**0.29**	**1.20**	**1.56**	**1.54**	**1.51**	**1.36**	**1.21**	**1.09**	**0.95**	**0.86**	**0.77**	**0.64**	**0.55**	**0.49**	**0.42**	**0.37**	**0.30**	**0.24**	**0.21**	**0.18**	**0.14**	**0.12**	**0.10**	**0.08**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**
2017	**0.01**	**0.34**	**1.14**	**1.43**	**1.44**	**1.36**	**1.21**	**1.11**	**0.97**	**0.88**	**0.78**	**0.65**	**0.56**	**0.51**	**0.44**	**0.38**	**0.30**	**0.25**	**0.22**	**0.18**	**0.15**	**0.13**	**0.11**	**0.08**	**0.07**	**0.06**	**0.04**	**0.04**	**0.03**	**0.02**
2018	**0.01**	**0.32**	**1.04**	**1.40**	**1.42**	**1.32**	**1.22**	**1.09**	**0.99**	**0.88**	**0.76**	**0.66**	**0.59**	**0.51**	**0.43**	**0.34**	**0.28**	**0.25**	**0.20**	**0.16**	**0.14**	**0.12**	**0.09**	**0.08**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**
2019	**0.02**	**0.33**	**1.15**	**1.52**	**1.49**	**1.39**	**1.27**	**1.17**	**1.08**	**0.93**	**0.83**	**0.76**	**0.65**	**0.55**	**0.42**	**0.35**	**0.31**	**0.25**	**0.21**	**0.18**	**0.15**	**0.12**	**0.10**	**0.08**	**0.07**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**

Conditional Prepayment Rates All Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1983	0.35	0.84	2.12	18.72	29.24	12.37	9.51	11.34	13.71	22.33	22.63	23.08	9.39	10.67	9.21	10.83	13.36	6.35	5.52	6.35	5.93	5.18	3.68	2.70	2.09	1.69	1.21	1.26	1.38	**1.58**
1984	0.27	1.49	21.00	29.01	13.51	10.94	11.94	12.64	19.27	20.53	21.95	9.16	10.28	8.93	10.45	11.40	6.22	5.55	6.07	6.04	5.10	4.08	6.36	2.19	2.32	3.66	1.65	2.62	**1.43**	**0.04**
1985	0.35	12.10	25.56	11.83	9.64	11.94	14.26	24.50	25.82	25.21	9.50	11.21	9.75	12.16	12.93	7.73	6.83	7.85	7.80	6.52	4.98	9.18	2.76	3.03	6.11	2.24	2.40	**1.38**	**0.07**	**0.06**
1986	0.59	4.09	2.98	3.54	4.97	6.09	15.67	28.24	27.13	8.07	12.30	10.43	17.09	18.99	10.27	12.53	16.94	18.97	15.00	10.93	13.79	6.31	4.93	6.25	3.65	3.87	**2.95**	**0.38**	**0.32**	**0.24**
1987	0.27	0.98	1.87	3.13	3.73	9.28	20.91	22.21	6.95	10.76	9.29	16.13	19.31	10.32	13.50	19.30	24.25	18.61	13.88	15.72	7.84	6.43	6.76	5.16	5.28	**4.23**	**0.76**	**0.63**	**0.49**	**0.35**
1988	0.31	1.37	3.30	5.05	15.41	28.65	27.09	8.15	12.38	10.35	16.21	18.70	10.78	12.97	17.03	19.26	16.11	12.28	15.24	7.05	5.32	5.16	3.76	4.73	**2.85**	**0.55**	**0.43**	**0.35**	**0.28**	**0.19**
1989	0.32	1.87	4.40	16.59	31.62	29.69	8.47	12.80	10.46	16.97	19.42	10.91	13.24	18.41	20.46	17.78	13.46	16.22	7.27	5.25	4.87	3.48	4.69	**3.02**	**0.60**	**0.50**	**0.41**	**0.32**	**0.24**	**0.17**
1990	0.40	2.14	10.78	33.31	32.19	8.53	13.27	10.54	17.67	20.47	10.99	13.96	20.17	23.02	19.54	14.60	19.86	8.35	6.17	5.89	4.13	4.88	**3.47**	**0.78**	**0.66**	**0.54**	**0.43**	**0.32**	**0.25**	**0.20**
1991	0.39	5.99	28.52	31.64	7.88	13.22	10.67	18.66	21.34	11.00	15.41	21.91	26.04	21.63	16.07	19.53	9.29	6.54	6.54	4.16	4.73	**3.63**	**0.99**	**0.81**	**0.69**	**0.57**	**0.45**	**0.37**	**0.32**	**0.25**
1992	0.62	9.29	17.32	6.54	11.59	10.07	19.04	22.53	11.33	17.45	24.97	32.55	25.57	19.04	16.07	11.98	8.67	6.44	5.50	4.90	**4.53**	**1.72**	**1.29**	**1.18**	**1.07**	**0.90**	**0.76**	**0.71**	**0.61**	**0.47**
1993	1.37	6.64	4.70	8.54	8.13	14.65	18.81	10.73	16.88	25.62	39.42	29.17	21.86	17.32	12.63	9.70	7.81	6.81	5.92	**5.80**	**2.56**	**1.93**	**1.77**	**1.58**	**1.31**	**1.10**	**1.05**	**0.93**	**0.78**	**0.62**
1994	0.89	2.92	7.22	7.51	13.46	16.18	9.93	15.79	22.51	36.84	28.09	21.72	17.00	12.80	9.80	7.73	6.56	6.14	**6.61**	**3.08**	**2.25**	**2.09**	**1.90**	**1.59**	**1.34**	**1.29**	**1.17**	**1.00**	**0.85**	**0.57**
1995	1.91	9.86	9.89	21.66	20.88	10.51	18.25	24.97	33.45	28.11	23.17	18.58	14.00	9.03	5.99	5.14	4.48	**4.71**	**2.54**	**1.91**	**1.77**	**1.61**	**1.37**	**1.15**	**1.09**	**0.97**	**0.84**	**0.73**	**0.56**	**0.44**
1996	0.62	4.26	18.77	20.87	10.01	18.24	25.36	36.34	29.65	24.35	18.99	14.17	9.66	6.78	5.52	4.94	**5.53**	**3.09**	**2.34**	**2.17**	**1.96**	**1.65**	**1.40**	**1.35**	**1.22**	**1.05**	**0.94**	**0.74**	**0.63**	**0.48**
1997	0.98	14.96	24.47	11.25	21.87	25.89	34.93	28.88	24.03	19.11	14.29	9.80	6.26	4.84	4.29	**5.13**	**3.21**	**2.39**	**2.26**	**2.11**	**1.82**	**1.55**	**1.49**	**1.36**	**1.19**	**1.05**	**0.83**	**0.73**	**0.61**	**0.48**
1998	2.04	10.68	7.62	16.37	24.43	40.81	32.45	26.39	19.68	14.50	9.97	7.87	5.99	5.31	**6.38**	**4.21**	**3.16**	**2.96**	**2.66**	**2.24**	**1.91**	**1.86**	**1.72**	**1.52**	**1.37**	**1.12**	**0.98**	**0.86**	**0.73**	**0.56**
1999	0.96	3.53	13.40	22.96	40.01	32.04	26.69	19.55	14.21	9.91	8.13	6.28	5.66	**7.12**	**4.75**	**3.51**	**3.30**	**2.97**	**2.49**	**2.13**	**2.09**	**1.96**	**1.75**	**1.59**	**1.31**	**1.16**	**1.02**	**0.89**	**0.73**	**0.56**
2000	0.97	29.20	35.43	38.03	30.22	26.16	20.15	15.37	9.73	6.53	4.69	3.77	**4.92**	**3.38**	**2.68**	**2.52**	**2.31**	**1.97**	**1.68**	**1.62**	**1.49**	**1.31**	**1.17**	**0.95**	**0.84**	**0.73**	**0.64**	**0.53**	**0.45**	**0.35**
2001	5.72	22.50	46.22	34.24	27.77	20.12	14.04	9.76	8.63	5.92	4.92	**6.09**	**4.11**	**3.25**	**3.09**	**2.79**	**2.36**	**2.03**	**2.02**	**1.91**	**1.72**	**1.57**	**1.31**	**1.17**	**1.04**	**0.93**	**0.81**	**0.71**	**0.62**	**0.49**
2002	4.72	38.17	32.01	27.23	19.78	14.90	10.16	9.36	6.75	5.69	**7.18**	**4.78**	**3.64**	**3.59**	**3.38**	**2.90**	**2.52**	**2.55**	**2.45**	**2.24**	**2.08**	**1.74**	**1.59**	**1.43**	**1.28**	**1.11**	**1.00**	**0.89**	**0.76**	**0.59**
2003	11.38	22.13	25.23	18.02	13.13	8.84	9.11	7.25	6.79	**8.87**	**5.53**	**4.03**	**4.16**	**4.08**	**3.54**	**3.02**	**3.08**	**3.05**	**2.87**	**2.68**	**2.23**	**2.08**	**1.91**	**1.72**	**1.51**	**1.37**	**1.25**	**1.10**	**0.93**	**0.73**
2004	7.72	21.13	16.94	12.65	7.87	7.46	6.11	5.79	**8.48**	**5.40**	**3.93**	**4.17**	**4.23**	**3.76**	**3.25**	**3.32**	**3.32**	**3.16**	**2.96**	**2.46**	**2.33**	**2.14**	**1.93**	**1.70**	**1.55**	**1.42**	**1.26**	**1.10**	**0.95**	**0.68**
2005	7.20	11.80	11.00	7.59	7.29	5.67	5.27	**7.78**	**4.78**	**3.43**	**3.82**	**4.04**	**3.70**	**3.28**	**3.43**	**3.48**	**3.36**	**3.20**	**2.71**	**2.58**	**2.41**	**2.20**	**1.96**	**1.82**	**1.68**	**1.52**	**1.36**	**1.25**	**1.07**	**0.78**
2006	1.43	7.73	9.11	12.30	7.54	6.32	**7.98**	**3.90**	**2.72**	**3.17**	**3.39**	**3.12**	**2.79**	**2.98**	**3.06**	**2.99**	**2.90**	**2.50**	**2.38**	**2.23**	**2.04**	**1.84**	**1.71**	**1.60**	**1.45**	**1.31**	**1.23**	**1.09**	**0.89**	**0.75**
2007	1.44	11.39	15.89	8.06	5.87	**6.97**	**3.32**	**2.21**	**2.73**	**3.02**	**2.80**	**2.51**	**2.72**	**2.80**	**2.76**	**2.70**	**2.35**	**2.23**	**2.08**	**1.93**	**1.75**	**1.63**	**1.53**	**1.40**	**1.26**	**1.20**	**1.08**	**0.91**	**0.84**	**0.71**
2008	2.13	22.52	12.55	8.09	**8.80**	**3.58**	**2.24**	**2.93**	**3.40**	**3.20**	**2.89**	**3.16**	**3.32**	**3.30**	**3.22**	**2.77**	**2.64**	**2.48**	**2.29**	**2.08**	**1.95**	**1.83**	**1.67**	**1.53**	**1.45**	**1.31**	**1.11**	**1.06**	**0.99**	**0.83**
2009	6.14	9.06	7.98	**10.57**	**4.24**	**3.07**	**3.89**	**4.77**	**4.63**	**4.25**	**4.61**	**4.93**	**4.88**	**4.71**	**3.96**	**3.84**	**3.61**	**3.34**	**2.98**	**2.82**	**2.62**	**2.41**	**2.23**	**2.09**	**1.90**	**1.57**	**1.52**	**1.46**	**1.33**	**0.97**
2010	1.86	5.31	**11.35**	**5.73**	**4.36**	**5.34**	**6.44**	**6.19**	**5.65**	**6.04**	**6.38**	**6.21**	**5.94**	**4.96**	**4.78**	**4.51**	**4.19**	**3.72**	**3.54**	**3.26**	**3.00**	**2.79**	**2.65**	**2.40**	**1.96**	**1.90**	**1.83**	**1.70**	**1.34**	**1.17**
2011	0.61	**12.47**	**8.65**	**6.00**	**7.27**	**8.53**	**7.95**	**7.07**	**7.54**	**7.90**	**7.56**	**7.21**	**5.88**	**5.61**	**5.36**	**4.95**	**4.37**	**4.18**	**3.83**	**3.51**	**3.27**	**3.16**	**2.82**	**2.26**	**2.21**	**2.12**	**1.97**	**1.58**	**1.52**	**1.14**
2012	**1.88**	**8.38**	**7.04**	**8.97**	**10.03**	**8.93**	**7.87**	**8.40**	**8.91**	**8.56**	**8.10**	**6.54**	**6.28**	**6.09**	**5.62**	**4.91**	**4.73**	**4.30**	**3.92**	**3.66**	**3.55**	**3.17**	**2.52**	**2.49**	**2.37**	**2.19**	**1.77**	**1.77**	**1.47**	**1.19**
2013	**3.62**	**10.49**	**15.28**	**14.72**	**12.21**	**10.81**	**11.47**	**11.29**	**10.37**	**9.83**	**7.85**	**7.34**	**7.11**	**6.38**	**5.50**	**5.08**	**4.49**	**4.21**	**3.91**	**3.95**	**3.67**	**2.91**	**2.75**	**2.65**	**2.36**	**1.94**	**1.90**	**1.59**	**1.39**	**1.03**
2014	**5.06**	**23.90**	**22.92**	**17.99**	**15.24**	**14.53**	**13.08**	**11.81**	**10.67**	**8.80**	**8.20**	**7.60**	**6.64**	**5.99**	**5.41**	**4.63**	**4.15**	**4.08**	**4.25**	**3.94**	**2.92**	**2.58**	**2.46**	**2.23**	**1.78**	**1.65**	**1.33**	**1.26**	**0.98**	**0.68**
2015	**5.93**	**23.86**	**21.23**	**18.23**	**17.08**	**15.25**	**14.06**	**12.98**	**10.18**	**9.48**	**8.44**	**7.69**	**6.86**	**6.20**	**5.45**	**4.72**	**4.63**	**4.70**	**4.16**	**3.15**	**2.85**	**2.60**	**2.11**	**1.56**	**1.84**	**1.43**	**1.29**	**1.03**	**0.79**	**0.57**
2016	**7.34**	**21.32**	**21.59**	**20.59**	**17.86**	**15.10**	**13.74**	**11.36**	**10.45**	**9.07**	**8.76**	**7.94**	**6.95**	**6.21**	**5.82**	**5.28**	**4.78**	**3.96**	**3.14**	**2.99**	**2.95**	**2.43**	**1.87**	**1.93**	**1.69**	**1.43**	**1.10**	**0.93**	**0.82**	**0.72**
2017	**7.74**	**22.84**	**23.07**	**18.98**	**15.37**	**13.90**	**12.27**	**10.69**	**9.28**	**8.87**	**8.09**	**7.16**	**6.52**	**6.50**	**5.75**	**5.31**	**3.93**	**3.37**	**3.34**	**3.27**	**2.78**	**2.12**	**2.05**	**2.04**	**1.67**	**1.26**	**1.07**	**1.05**	**0.94**	**0.70**
2018	**7.37**	**22.65**	**20.76**	**16.97**	**15.76**	**13.40**	**11.32**	**10.54**	**9.37**	**8.75**	**7.54**	**6.84**	**6.83**	**5.99**	**5.36**	**3.96**	**3.40**	**3.25**	**3.17**	**2.60**	**1.91**	**1.95**	**1.97**	**1.47**	**1.19**	**1.12**	**1.15**	**1.04**	**0.87**	**0.86**
2019	**8.07**	**20.87**	**20.74**	**18.79**	**14.15**	**12.41**	**12.13**	**10.51**	**9.68**	**8.66**	**7.70**	**7.20**	**6.47**	**5.55**	**4.23**	**3.43**	**3.57**	**3.52**	**2.98**	**2.08**	**2.07**	**1.98**	**1.55**	**1.41**	**1.45**	**1.54**	**1.43**	**1.16**	**1.24**	**0.87**

Cumulative Claim Rates All Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1983	0.01	0.46	1.90	3.93	6.46	9.01	10.84	11.95	12.70	13.28	13.66	13.94	14.12	14.23	14.31	14.38	14.42	14.45	14.46	14.47	14.48	14.49	14.49	14.50	14.50	14.50	14.50	14.50	14.50	**14.51**
1984	0.03	1.00	3.70	7.35	10.90	13.32	14.71	15.57	16.21	16.65	16.98	17.19	17.33	17.45	17.53	17.58	17.62	17.65	17.66	17.67	17.68	17.69	17.69	17.69	17.70	17.70	17.70	17.70	**17.70**	**17.70**
1985	0.02	0.85	3.66	7.36	10.07	11.79	13.00	13.90	14.55	14.99	15.29	15.47	15.63	15.74	15.81	15.86	15.89	15.92	15.93	15.94	15.95	15.95	15.95	15.96	15.96	15.96	15.97	**15.97**	**15.97**	**15.97**
1986	0.01	0.46	2.11	4.07	5.80	7.27	8.47	9.41	10.15	10.69	11.09	11.42	11.67	11.84	11.96	12.03	12.08	12.11	12.13	12.15	12.16	12.16	12.17	12.18	12.18	12.19	**12.19**	**12.20**	**12.20**	**12.20**
1987	0.01	0.36	1.36	2.54	3.70	4.81	5.77	6.60	7.25	7.76	8.21	8.57	8.83	9.01	9.10	9.17	9.22	9.26	9.28	9.30	9.31	9.31	9.33	9.34	9.35	**9.35**	**9.36**	**9.37**	**9.37**	**9.37**
1988	0.01	0.37	1.42	2.82	4.38	5.71	6.84	7.71	8.35	8.88	9.30	9.61	9.82	9.93	10.01	10.07	10.12	10.14	10.16	10.17	10.19	10.20	10.21	10.22	**10.23**	**10.24**	**10.25**	**10.25**	**10.25**	**10.25**
1989	0.01	0.32	1.34	2.83	4.32	5.65	6.65	7.39	7.98	8.41	8.72	8.94	9.05	9.14	9.20	9.25	9.28	9.30	9.31	9.32	9.33	9.35	9.36	**9.37**	**9.38**	**9.39**	**9.39**	**9.40**	**9.40**	**9.40**
1990	0.01	0.30	1.35	2.85	4.27	5.31	6.06	6.71	7.19	7.53	7.75	7.88	7.96	8.03	8.07	8.10	8.12	8.13	8.15	8.16	8.18	8.19	**8.20**	**8.21**	**8.22**	**8.23**	**8.23**	**8.23**	**8.23**	**8.23**
1991	0.01	0.31	1.40	2.73	3.87	4.76	5.57	6.18	6.60	6.88	7.04	7.14	7.21	7.27	7.30	7.32	7.33	7.35	7.36	7.37	7.39	**7.40**	**7.41**	**7.42**	**7.43**	**7.43**	**7.44**	**7.44**	**7.44**	**7.44**
1992	0.00	0.21	0.91	1.83	2.79	3.82	4.71	5.35	5.77	6.01	6.16	6.26	6.32	6.35	6.38	6.40	6.41	6.43	6.44	6.46	**6.48**	**6.50**	**6.52**	**6.53**	**6.53**	**6.54**	**6.54**	**6.55**	**6.55**	**6.55**
1993	0.00	0.16	0.72	1.57	2.72	3.72	4.48	4.98	5.25	5.42	5.53	5.61	5.64	5.67	5.68	5.70	5.71	5.73	5.75	**5.77**	**5.80**	**5.82**	**5.83**	**5.84**	**5.85**	**5.85**	**5.85**	**5.86**	**5.86**	**5.86**
1994	0.00	0.22	0.93	2.09	3.35	4.35	4.98	5.33	5.57	5.73	5.83	5.89	5.92	5.95	5.97	5.99	6.02	6.04	**6.07**	**6.12**	**6.14**	**6.16**	**6.17**	**6.18**	**6.19**	**6.20**	**6.20**	**6.21**	**6.21**	**6.21**
1995	0.01	0.29	1.49	3.28	4.90	5.99	6.66	7.10	7.47	7.70	7.82	7.89	7.94	7.98	8.03	8.08	8.12	**8.17**	**8.23**	**8.27**	**8.29**	**8.31**	**8.33**	**8.34**	**8.34**	**8.35**	**8.36**	**8.36**	**8.36**	**8.37**
1996	0.00	0.31	1.59	3.33	4.67	5.52	6.11	6.59	6.88	7.04	7.14	7.20	7.25	7.30	7.36	7.42	**7.48**	**7.58**	**7.63**	**7.66**	**7.68**	**7.70**	**7.72**	**7.73**	**7.74**	**7.74**	**7.75**	**7.75**	**7.75**	**7.76**
1997	0.01	0.40	1.75	3.23	4.29	5.10	5.76	6.16	6.38	6.51	6.60	6.68	6.75	6.82	6.88	**6.96**	**7.09**	**7.15**	**7.18**	**7.21**	**7.24**	**7.26**	**7.27**	**7.28**	**7.29**	**7.30**	**7.30**	**7.31**	**7.31**	**7.31**
1998	0.01	0.34	1.35	2.37	3.25	4.05	4.55	4.85	5.03	5.15	5.25	5.34	5.44	5.53	**5.65**	**5.83**	**5.91**	**5.96**	**6.00**	**6.03**	**6.05**	**6.07**	**6.08**	**6.09**	**6.10**	**6.10**	**6.11**	**6.11**	**6.11**	**6.12**
1999	0.01	0.32	1.15	2.19	3.33	4.10	4.56	4.82	4.99	5.12	5.26	5.40	5.54	**5.72**	**5.98**	**6.10**	**6.17**	**6.23**	**6.27**	**6.30**	**6.32**	**6.34**	**6.35**	**6.36**	**6.36**	**6.37**	**6.37**	**6.38**	**6.38**	**6.38**
2000	0.01	0.50	1.88	3.65	4.85	5.51	5.89	6.13	6.34	6.51	6.69	6.83	**7.02**	**7.30**	**7.44**	**7.54**	**7.62**	**7.68**	**7.72**	**7.75**	**7.77**	**7.79**	**7.80**	**7.81**	**7.82**	**7.82**	**7.83**	**7.83**	**7.83**	**7.84**
2001	0.01	0.41	1.74	3.10	3.98	4.50	4.83	5.11	5.33	5.58	5.80	**6.08**	**6.50**	**6.68**	**6.82**	**6.94**	**7.01**	**7.06**	**7.10**	**7.12**	**7.14**	**7.16**	**7.17**	**7.18**	**7.18**	**7.19**	**7.19**	**7.19**	**7.20**	**7.20**
2002	0.01	0.46	1.67	2.75	3.46	3.96	4.37	4.73	5.12	5.45	**5.90**	**6.57**	**6.85**	**7.08**	**7.26**	**7.37**	**7.46**	**7.52**	**7.56**	**7.59**	**7.61**	**7.63**	**7.65**	**7.66**	**7.67**	**7.67**	**7.68**	**7.68**	**7.69**	**7.69**
2003	0.01	0.61	1.68	2.55	3.22	3.83	4.42	5.10	5.66	**6.53**	**7.75**	**8.24**	**8.61**	**8.91**	**9.10**	**9.24**	**9.34**	**9.41**	**9.46**	**9.51**	**9.54**	**9.56**	**9.58**	**9.60**	**9.61**	**9.62**	**9.63**	**9.63**	**9.64**	**9.64**
2004	0.12	0.93	1.97	2.95	3.98	4.98	6.10	7.05	**8.53**	**10.60**	**11.43**	**12.06**	**12.57**	**12.89**	**13.13**	**13.31**	**13.43**	**13.52**	**13.59**	**13.65**	**13.69**	**13.72**	**13.75**	**13.77**	**13.78**	**13.80**	**13.81**	**13.82**	**13.82**	**13.83**
2005	0.11	0.82	2.30	4.16	6.19	8.40	10.22	**12.76**	**16.30**	**17.74**	**18.84**	**19.77**	**20.38**	**20.84**	**21.16**	**21.39**	**21.56**	**21.69**	**21.79**	**21.86**	**21.92**	**21.96**	**21.99**	**22.02**	**22.04**	**22.05**	**22.07**	**22.08**	**22.08**	**22.09**
2006	0.02	0.63	2.64	5.61	9.14	11.84	**15.42**	**20.14**	**22.06**	**23.47**	**24.65**	**25.40**	**25.96**	**26.38**	**26.67**	**26.88**	**27.05**	**27.16**	**27.25**	**27.32**	**27.36**	**27.40**	**27.43**	**27.45**	**27.47**	**27.48**	**27.49**	**27.49**	**27.50**	**27.50**
2007	0.02	0.83	3.59	7.65	10.65	**15.34**	**21.61**	**24.11**	**25.82**	**27.21**	**28.08**	**28.71**	**29.18**	**29.52**	**29.78**	**29.97**	**30.11**	**30.21**	**30.29**	**30.35**	**30.39**	**30.42**	**30.45**	**30.47**	**30.48**	**30.49**	**30.50**	**30.50**	**30.51**	**30.51**
2008	0.01	0.69	3.28	5.90	**10.13**	**15.73**	**18.16**	**19.69**	**20.89**	**21.63**	**22.16**	**22.56**	**22.85**	**23.07**	**23.24**	**23.36**	**23.46**	**23.53**	**23.58**	**23.62**	**23.65**	**23.67**	**23.69**	**23.70**	**23.71**	**23.72**	**23.73**	**23.73**	**23.73**	**23.73**
2009	0.01	0.50	1.65	**4.01**	**7.44**	**8.90**	**10.03**	**10.94**	**11.51**	**11.94**	**12.25**	**12.49**	**12.67**	**12.82**	**12.92**	**13.00**	**13.06**	**13.11**	**13.14**	**13.17**	**13.19**	**13.21**	**13.22**	**13.23**	**13.24**	**13.24**	**13.25**	**13.25**	**13.25**	**13.25**
2010	0.01	0.23	**1.21**	**3.14**	**4.11**	**5.04**	**5.88**	**6.44**	**6.87**	**7.20**	**7.44**	**7.63**	**7.77**	**7.88**	**7.97**	**8.03**	**8.08**	**8.12**	**8.15**	**8.17**	**8.19**	**8.20**	**8.21**	**8.22**	**8.23**	**8.23**	**8.23**	**8.24**	**8.24**	**8.24**
2011	0.01	**0.27**	**1.27**	**1.99**	**2.78**	**3.54**	**4.05**	**4.43**	**4.72**	**4.92**	**5.08**	**5.21**	**5.30**	**5.37**	**5.43**	**5.47**	**5.50**	**5.53**	**5.55**	**5.56**	**5.57**	**5.58**	**5.59**	**5.60**	**5.60**	**5.60**	**5.61**	**5.61**	**5.61**	**5.61**
2012	**0.02**	**0.25**	**0.70**	**1.39**	**2.10**	**2.59**	**2.97**	**3.24**	**3.45**	**3.61**	**3.73**	**3.82**	**3.89**	**3.95**	**3.99**	**4.02**	**4.05**	**4.06**	**4.08**	**4.09**	**4.10**	**4.11**	**4.11**	**4.12**	**4.12**	**4.12**	**4.13**	**4.13**	**4.13**	**4.13**
2013	**0.01**	**0.20**	**1.01**	**2.11**	**2.90**	**3.47**	**3.88**	**4.17**	**4.41**	**4.58**	**4.71**	**4.82**	**4.89**	**4.95**	**5.00**	**5.04**	**5.06**	**5.09**	**5.10**	**5.12**	**5.13**	**5.14**	**5.15**	**5.15**	**5.16**	**5.16**	**5.16**	**5.17**	**5.17**	**5.17**
2014	**0.01**	**0.29**	**1.29**	**2.28**	**3.05**	**3.59**	**3.99**	**4.30**	**4.54**	**4.72**	**4.87**	**4.98**	**5.06**	**5.13**	**5.18**	**5.22**	**5.26**	**5.28**	**5.31**	**5.32**	**5.34**	**5.35**	**5.36**	**5.36**	**5.37**	**5.37**	**5.38**	**5.38**	**5.38**	**5.38**
2015	**0.01**	**0.31**	**1.15**	**2.09**	**2.82**	**3.36**	**3.80**	**4.13**	**4.38**	**4.58**	**4.73**	**4.85**	**4.94**	**5.02**	**5.07**	**5.12**	**5.15**	**5.19**	**5.21**	**5.23**	**5.24**	**5.26**	**5.27**	**5.27**	**5.28**	**5.28**	**5.29**	**5.29**	**5.29**	**5.29**
2016	**0.01**	**0.29**	**1.15**	**2.02**	**2.69**	**3.20**	**3.59**	**3.88**	**4.11**	**4.29**	**4.43**	**4.54**	**4.62**	**4.69**	**4.74**	**4.78**	**4.82**	**4.84**	**4.87**	**4.88**	**4.90**	**4.91**	**4.92**	**4.92**	**4.93**	**4.93**	**4.94**	**4.94**	**4.94**	**4.94**
2017	**0.01**	**0.33**	**1.14**	**1.90**	**2.50**	**2.97**	**3.33**	**3.61**	**3.82**	**3.99**	**4.13**	**4.23**	**4.31**	**4.38**	**4.43**	**4.47**	**4.50**	**4.52**	**4.54**	**4.56**	**4.57**	**4.58**	**4.59**	**4.60**	**4.60**	**4.61**	**4.61**	**4.61**	**4.62**	**4.62**
2018	**0.01**	**0.31**	**1.06**	**1.83**	**2.47**	**2.95**	**3.33**	**3.63**	**3.86**	**4.05**	**4.19**	**4.30**	**4.40**	**4.47**	**4.52**	**4.57**	**4.60**	**4.62**	**4.65**	**4.66**	**4.67**	**4.69**	**4.69**	**4.70**	**4.71**	**4.71**	**4.71**	**4.72**	**4.72**	**4.72**
2019	**0.02**	**0.32**	**1.15**	**2.00**	**2.66**	**3.18**	**3.58**	**3.90**	**4.16**	**4.36**	**4.52**	**4.65**	**4.75**	**4.83**	**4.89**	**4.93**	**4.97**	**4.99**	**5.02**	**5.03**	**5.05**	**5.06**	**5.07**	**5.08**	**5.08**	**5.09**	**5.09**	**5.10**	**5.10**	**5.10**

Cumulative Prepayment Rates All Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1983	0.35	1.19	3.29	21.05	42.99	49.25	53.23	57.31	61.53	67.32	71.75	75.12	76.18	77.26	78.18	79.57	80.39	80.72	81.00	81.34	81.67	81.87	82.01	82.12	82.20	82.32	82.36	82.41	82.46	**82.52**
1984	0.27	1.76	22.21	43.70	50.31	54.55	58.38	61.78	66.18	69.83	72.80	73.75	74.70	75.45	76.42	77.48	77.79	78.05	78.33	78.62	78.87	79.02	79.23	79.30	79.40	79.57	79.62	79.70	**79.74**	**79.74**
1985	0.35	12.45	34.64	41.95	46.84	51.98	57.15	64.49	70.09	73.95	75.00	76.09	76.92	77.84	78.76	79.74	80.04	80.36	80.65	80.89	81.08	81.34	81.42	81.50	81.67	81.74	81.80	**81.83**	**81.83**	**81.83**
1986	0.59	4.67	7.52	10.73	14.99	19.85	31.34	48.40	59.85	62.30	65.66	68.12	71.63	74.82	76.40	78.65	80.25	81.72	82.66	83.25	83.93	84.19	84.37	84.60	84.73	84.90	**84.99**	**85.00**	**85.01**	**85.02**
1987	0.27	1.25	3.10	6.11	9.54	17.62	33.88	47.30	50.55	55.13	58.62	64.01	69.34	71.67	74.64	78.24	81.32	83.09	84.17	85.22	85.70	86.03	86.36	86.59	86.85	**87.06**	**87.09**	**87.11**	**87.13**	**87.15**
1988	0.31	1.68	4.92	9.67	23.18	43.96	57.60	60.51	64.46	67.29	71.17	74.82	76.53	78.33	80.46	82.56	83.75	84.50	85.31	85.64	85.90	86.11	86.25	86.43	**86.54**	**86.56**	**86.58**	**86.59**	**86.60**	**86.61**
1989	0.32	2.19	6.49	21.80	45.67	60.52	63.39	67.24	69.90	73.67	77.16	78.71	80.36	82.33	84.17	85.48	86.19	86.92	87.19	87.39	87.58	87.69	87.84	**87.92**	**87.94**	**87.96**	**87.97**	**87.98**	**87.99**	**87.99**
1990	0.40	2.54	13.04	41.61	59.49	62.59	66.86	69.73	73.91	77.78	79.41	81.22	83.43	85.43	86.78	87.66	88.50	88.78	88.97	89.15	89.29	89.42	**89.51**	**89.53**	**89.54**	**89.55**	**89.56**	**89.57**	**89.58**	**89.59**
1991	0.39	6.38	33.07	53.81	57.25	62.40	65.93	71.26	76.09	78.01	80.35	83.13	85.67	87.22	88.17	89.19	89.52	89.72	89.92	90.04	90.18	**90.27**	**90.29**	**90.31**	**90.33**	**90.34**	**90.35**	**90.36**	**90.37**	**90.38**
1992	0.62	9.90	25.48	30.33	38.23	44.21	54.14	63.43	67.00	71.78	77.34	82.72	85.55	87.12	88.26	89.16	89.55	89.81	90.03	90.21	**90.38**	**90.44**	**90.48**	**90.52**	**90.55**	**90.58**	**90.61**	**90.63**	**90.65**	**90.67**
1993	1.38	7.96	12.31	19.79	26.24	36.71	47.95	53.10	60.21	69.03	79.02	83.46	85.85	87.39	88.53	89.73	90.09	90.38	90.62	**90.84**	**90.93**	**90.99**	**91.05**	**91.10**	**91.14**	**91.18**	**91.21**	**91.24**	**91.26**	**91.29**
1994	0.90	3.81	10.76	17.44	28.31	39.39	45.02	52.93	62.30	74.04	79.66	82.80	84.77	86.07	87.39	88.43	88.80	89.13	**89.46**	**89.61**	**89.71**	**89.79**	**89.87**	**89.94**	**89.99**	**90.04**	**90.09**	**90.13**	**90.17**	**90.19**
1995	1.92	11.62	20.37	37.35	49.77	54.55	61.79	69.68	77.47	81.70	84.16	85.65	86.57	87.08	87.47	87.85	88.04	**88.22**	**88.32**	**88.39**	**88.45**	**88.50**	**88.55**	**88.59**	**88.62**	**88.66**	**88.68**	**88.71**	**88.73**	**88.75**
1996	0.62	4.88	22.74	38.56	44.41	53.73	64.09	74.96	80.44	83.53	85.33	86.41	87.05	87.47	87.87	88.28	**88.52**	**88.65**	**88.74**	**88.82**	**88.89**	**88.95**	**89.00**	**89.05**	**89.09**	**89.13**	**89.16**	**89.18**	**89.21**	**89.23**
1997	0.99	15.88	36.42	43.41	55.12	65.66	75.91	81.22	84.26	86.06	87.13	87.76	88.12	88.39	88.65	**88.97**	**89.11**	**89.20**	**89.28**	**89.36**	**89.43**	**89.48**	**89.53**	**89.58**	**89.62**	**89.65**	**89.68**	**89.71**	**89.73**	**89.75**
1998	2.05	12.56	19.24	32.31	48.32	68.17	77.20	82.03	84.62	86.13	87.02	87.64	88.09	88.46	**88.90**	**89.15**	**89.31**	**89.45**	**89.57**	**89.67**	**89.75**	**89.83**	**89.90**	**89.96**	**90.01**	**90.06**	**90.10**	**90.13**	**90.16**	**90.19**
1999	0.97	4.49	17.29	36.07	60.87	72.37	78.66	81.95	83.84	84.96	85.79	86.37	86.87	**87.47**	**87.86**	**88.10**	**88.29**	**88.45**	**88.58**	**88.69**	**88.79**	**88.89**	**88.97**	**89.04**	**89.10**	**89.16**	**89.20**	**89.25**	**89.28**	**89.31**
2000	0.97	29.98	54.66	71.24	78.85	83.13	85.43	86.77	87.47	87.88	88.15	88.35	**88.60**	**88.76**	**88.88**	**88.98**	**89.06**	**89.13**	**89.19**	**89.24**	**89.29**	**89.33**	**89.36**	**89.39**	**89.42**	**89.44**	**89.46**	**89.48**	**89.49**	**89.51**
2001	5.74	27.04	60.69	73.60	80.09	83.31	85.03	86.03	86.80	87.27	87.64	**88.05**	**88.32**	**88.50**	**88.67**	**88.81**	**88.91**	**89.00**	**89.08**	**89.15**	**89.22**	**89.28**	**89.32**	**89.37**	**89.40**	**89.44**	**89.46**	**89.49**	**89.51**	**89.53**
2002	4.74	41.28	59.99	70.47	75.79	78.90	80.66	82.07	82.97	83.67	**84.48**	**84.99**	**85.34**	**85.66**	**85.95**	**86.17**	**86.33**	**86.49**	**86.63**	**86.77**	**86.88**	**86.98**	**87.06**	**87.14**	**87.20**	**87.26**	**87.31**	**87.36**	**87.40**	**87.44**
2003	11.45	31.14	48.44	57.47	62.75	65.78	68.57	70.56	72.24	**74.26**	**75.39**	**76.15**	**76.89**	**77.56**	**78.12**	**78.53**	**78.90**	**79.25**	**79.58**	**79.87**	**80.10**	**80.30**	**80.49**	**80.66**	**80.80**	**80.93**	**81.05**	**81.15**	**81.24**	**81.33**
2004	7.82	27.38	39.58	47.01	50.97	54.36	56.87	59.04	**61.98**	**63.66**	**64.76**	**65.85**	**66.89**	**67.76**	**68.47**	**69.09**	**69.67**	**70.19**	**70.67**	**71.05**	**71.40**	**71.71**	**71.98**	**72.22**	**72.43**	**72.62**	**72.79**	**72.94**	**73.08**	**73.19**
2005	7.31	18.31	27.26	32.64	37.28	40.51	43.23	**46.90**	**48.90**	**50.16**	**51.46**	**52.72**	**53.80**	**54.71**	**55.62**	**56.45**	**57.20**	**57.89**	**58.45**	**58.97**	**59.44**	**59.85**	**60.21**	**60.54**	**60.83**	**61.10**	**61.34**	**61.56**	**61.75**	**61.91**
2006	1.44	9.10	17.35	27.23	32.31	36.03	**40.23**	**42.00**	**43.06**	**44.21**	**45.34**	**46.31**	**47.14**	**47.98**	**48.81**	**49.56**	**50.26**	**50.83**	**51.37**	**51.86**	**52.29**	**52.67**	**53.02**	**53.35**	**53.64**	**53.90**	**54.15**	**54.37**	**54.56**	**54.74**
2007	1.45	12.71	26.51	32.16	35.72	**39.49**	**41.00**	**41.85**	**42.80**	**43.77**	**44.61**	**45.31**	**46.04**	**46.77**	**47.45**	**48.08**	**48.61**	**49.09**	**49.53**	**49.93**	**50.28**	**50.60**	**50.90**	**51.17**	**51.42**	**51.65**	**51.85**	**52.03**	**52.20**	**52.37**
2008	2.14	24.26	33.71	38.83	**43.73**	**45.40**	**46.29**	**47.35**	**48.49**	**49.50**	**50.36**	**51.26**	**52.16**	**53.01**	**53.82**	**54.47**	**55.07**	**55.61**	**56.09**	**56.52**	**56.92**	**57.28**	**57.61**	**57.90**	**58.18**	**58.43**	**58.64**	**58.84**	**59.04**	**59.23**
2009	6.17	14.72	21.52	**29.69**	**32.53**	**34.40**	**36.63**	**39.21**	**41.56**	**43.59**	**45.69**	**47.81**	**49.80**	**51.63**	**53.10**	**54.44**	**55.62**	**56.67**	**57.58**	**58.42**	**59.17**	**59.85**	**60.46**	**61.02**	**61.53**	**61.94**	**62.34**	**62.72**	**63.08**	**63.38**
2010	1.88	7.13	**17.72**	**22.41**	**25.69**	**29.48**	**33.74**	**37.53**	**40.74**	**43.96**	**47.14**	**50.01**	**52.60**	**54.63**	**56.50**	**58.13**	**59.53**	**60.72**	**61.82**	**62.79**	**63.66**	**64.45**	**65.17**	**65.81**	**66.33**	**66.83**	**67.30**	**67.74**	**68.10**	**68.47**
2011	0.61	**13.09**	**20.64**	**25.37**	**30.70**	**36.42**	**41.23**	**45.14**	**48.98**	**52.69**	**55.95**	**58.82**	**60.99**	**62.96**	**64.75**	**66.23**	**67.42**	**68.52**	**69.48**	**70.33**	**71.09**	**71.80**	**72.41**	**72.90**	**73.36**	**73.80**	**74.21**	**74.54**	**74.87**	**75.15**
2012	**1.90**	**10.17**	**16.53**	**24.00**	**31.52**	**37.47**	**42.20**	**46.83**	**51.31**	**55.21**	**58.59**	**61.12**	**63.40**	**65.50**	**67.34**	**68.73**	**69.90**	**70.92**	**71.81**	**72.60**	**73.34**	**73.98**	**74.48**	**74.96**	**75.41**	**75.81**	**76.14**	**76.47**	**76.75**	**77.01**
2013	**3.64**	**13.80**	**26.99**	**37.63**	**45.01**	**50.65**	**55.91**	**60.47**	**64.17**	**67.31**	**69.57**	**71.53**	**73.30**	**74.79**	**76.02**	**76.97**	**77.71**	**78.37**	**78.96**	**79.54**	**80.06**	**80.45**	**80.82**	**81.16**	**81.46**	**81.70**	**81.94**	**82.14**	**82.32**	**82.47**
2014	**5.09**	**27.90**	**44.42**	**54.23**	**60.88**	**66.14**	**70.12**	**73.21**	**75.66**	**77.45**	**78.98**	**80.28**	**81.34**	**82.25**	**83.03**	**83.60**	**84.04**	**84.45**	**84.87**	**85.24**	**85.50**	**85.73**	**85.94**	**86.12**	**86.27**	**86.41**	**86.52**	**86.62**	**86.71**	**86.78**
2015	**5.96**	**28.52**	**43.69**	**53.80**	**61.37**	**66.86**	**71.07**	**74.37**	**76.60**	**78.45**	**79.94**	**81.18**	**82.21**	**83.09**	**83.83**	**84.37**	**84.83**	**85.28**	**85.66**	**85.93**	**86.18**	**86.39**	**86.57**	**86.69**	**86.84**	**86.96**	**87.06**	**87.15**	**87.22**	**87.28**
2016	**7.39**	**27.25**	**42.98**	**54.55**	**62.34**	**67.63**	**71.66**	**74.49**	**76.79**	**78.55**	**80.10**	**81.39**	**82.44**	**83.31**	**84.11**	**84.71**	**85.17**	**85.54**	**85.81**	**86.07**	**86.32**	**86.52**	**86.67**	**86.82**	**86.95**	**87.06**	**87.15**	**87.23**	**87.30**	**87.37**
2017	**7.79**	**28.98**	**45.37**	**55.57**	**62.12**	**67.05**	**70.74**	**73.53**	**75.68**	**77.53**	**79.07**	**80.33**	**81.40**	**82.42**	**83.27**	**83.91**	**84.33**	**84.67**	**85.00**	**85.31**	**85.57**	**85.75**	**85.94**	**86.12**	**86.26**	**86.37**	**86.47**	**86.57**	**86.66**	**86.74**
2018	**7.41**	**28.51**	**43.35**	**52.81**	**59.97**	**65.00**	**68.63**	**71.60**	**73.94**	**75.91**	**77.46**	**78.77**	**79.99**	**80.99**	**81.83**	**82.36**	**82.76**	**83.13**	**83.48**	**83.76**	**83.96**	**84.16**	**84.36**	**84.51**	**84.63**	**84.75**	**84.87**	**84.98**	**85.08**	**85.19**
2019	**8.12**	**27.41**	**42.47**	**53.11**	**59.46**	**64.16**	**68.14**	**71.12**	**73.57**	**75.53**	**77.12**	**78.50**	**79.65**	**80.58**	**81.27**	**81.74**	**82.19**	**82.62**	**82.97**	**83.20**	**83.43**	**83.65**	**83.81**	**83.96**	**84.12**	**84.29**	**84.45**	**84.58**	**84.73**	**84.86**

Conditional Claim Rates Fixed Rate 30 Year Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1983	0.02	0.46	1.52	2.21	3.54	5.36	4.70	3.32	2.66	2.44	2.15	2.16	1.80	1.22	1.10	0.95	0.73	0.47	0.39	0.21	0.23	0.17	0.10	0.08	0.05	0.05	0.03	0.04	0.02	**0.04**
1984	0.03	1.00	2.88	5.13	7.62	6.61	4.60	3.47	3.05	2.70	2.67	2.28	1.75	1.63	1.22	1.03	0.80	0.54	0.36	0.27	0.18	0.15	0.12	0.09	0.06	0.08	0.07	0.06	**0.05**	**0.03**
1985	0.02	0.88	3.43	6.35	5.73	4.29	3.62	3.29	3.29	3.19	3.04	2.15	2.07	1.75	1.21	1.24	0.73	0.54	0.38	0.32	0.21	0.15	0.11	0.16	0.15	0.10	0.12	**0.08**	**0.11**	**0.08**
1986	0.01	0.48	1.84	2.31	2.15	1.95	1.76	1.66	1.89	1.97	1.61	1.55	1.32	1.14	1.00	0.65	0.49	0.43	0.42	0.28	0.19	0.20	0.14	0.17	0.20	0.24	**0.14**	**0.17**	**0.11**	**0.02**
1987	0.01	0.36	1.06	1.28	1.30	1.32	1.27	1.45	1.48	1.27	1.28	1.13	1.02	0.87	0.51	0.43	0.43	0.41	0.30	0.20	0.18	0.15	0.25	0.23	0.28	**0.18**	**0.24**	**0.16**	**0.03**	**0.02**
1988	0.01	0.37	1.07	1.50	1.78	1.87	2.35	2.58	2.14	2.10	1.88	1.74	1.46	0.89	0.75	0.68	0.67	0.47	0.40	0.24	0.30	0.32	0.32	0.36	**0.28**	**0.33**	**0.22**	**0.06**	**0.05**	**0.03**
1989	0.01	0.31	1.06	1.62	1.98	2.72	3.02	2.50	2.41	2.01	1.78	1.57	0.98	0.85	0.76	0.74	0.57	0.49	0.36	0.32	0.37	0.47	0.46	**0.45**	**0.44**	**0.24**	**0.10**	**0.08**	**0.05**	**0.03**
1990	0.01	0.28	1.07	1.76	2.62	2.91	2.38	2.45	2.10	1.85	1.58	1.03	0.81	0.79	0.72	0.55	0.49	0.47	0.47	0.40	0.62	0.54	**0.50**	**0.56**	**0.37**	**0.13**	**0.11**	**0.07**	**0.04**	**0.02**
1991	0.01	0.31	1.21	2.15	2.78	2.42	2.56	2.21	1.91	1.72	1.08	0.93	0.82	0.80	0.67	0.49	0.42	0.49	0.47	0.48	0.63	**0.49**	**0.71**	**0.46**	**0.17**	**0.15**	**0.10**	**0.06**	**0.04**	**0.02**
1992	0.01	0.22	0.85	1.40	1.43	1.76	1.69	1.61	1.42	1.00	0.78	0.70	0.68	0.61	0.48	0.38	0.46	0.42	0.45	0.60	**0.61**	**0.91**	**0.52**	**0.22**	**0.19**	**0.12**	**0.08**	**0.05**	**0.03**	**0.02**
1993	0.00	0.15	0.59	0.94	1.31	1.38	1.34	1.17	0.75	0.63	0.59	0.67	0.56	0.47	0.36	0.37	0.39	0.53	0.56	**0.65**	**0.97**	**0.67**	**0.22**	**0.19**	**0.12**	**0.08**	**0.05**	**0.04**	**0.03**	**0.02**
1994	0.00	0.18	0.66	1.20	1.53	1.53	1.26	0.84	0.72	0.67	0.74	0.65	0.52	0.44	0.38	0.50	0.61	0.63	**0.70**	**1.16**	**0.67**	**0.29**	**0.25**	**0.17**	**0.11**	**0.08**	**0.05**	**0.04**	**0.03**	**0.02**
1995	0.00	0.26	1.17	1.98	2.38	2.25	1.67	1.32	1.57	1.55	1.28	1.04	0.89	0.88	0.96	1.22	1.10	**1.18**	**1.91**	**1.04**	**0.56**	**0.50**	**0.33**	**0.22**	**0.15**	**0.10**	**0.08**	**0.05**	**0.04**	**0.02**
1996	0.00	0.28	1.20	1.96	2.09	1.60	1.35	1.54	1.67	1.40	1.11	0.97	0.90	0.98	1.25	1.10	**1.59**	**2.40**	**1.29**	**0.72**	**0.64**	**0.43**	**0.30**	**0.20**	**0.14**	**0.11**	**0.08**	**0.06**	**0.04**	**0.03**
1997	0.01	0.37	1.41	2.02	1.69	1.67	1.95	2.14	1.89	1.50	1.28	1.27	1.22	1.47	1.32	**1.73**	**2.99**	**1.53**	**0.93**	**0.84**	**0.56**	**0.39**	**0.27**	**0.19**	**0.15**	**0.11**	**0.08**	**0.06**	**0.04**	**0.03**
1998	0.01	0.30	1.11	1.27	1.37	1.70	1.92	1.78	1.53	1.24	1.22	1.30	1.56	1.51	**2.01**	**3.40**	**1.71**	**1.07**	**0.94**	**0.62**	**0.44**	**0.31**	**0.22**	**0.17**	**0.13**	**0.09**	**0.07**	**0.05**	**0.04**	**0.02**
1999	0.01	0.35	0.98	1.43	2.09	2.45	2.26	1.79	1.47	1.44	1.49	1.85	1.90	**2.49**	**4.09**	**2.04**	**1.37**	**1.17**	**0.77**	**0.55**	**0.39**	**0.28**	**0.21**	**0.16**	**0.11**	**0.09**	**0.06**	**0.05**	**0.04**	**0.02**
2000	0.01	0.49	2.07	4.24	5.19	4.47	3.65	3.03	2.96	2.76	3.26	2.89	**4.00**	**6.82**	**3.57**	**2.84**	**2.48**	**1.66**	**1.20**	**0.85**	**0.61**	**0.47**	**0.36**	**0.26**	**0.19**	**0.14**	**0.10**	**0.08**	**0.05**	**0.03**
2001	0.01	0.50	1.99	3.92	4.10	3.44	2.91	2.79	2.60	3.17	3.06	**4.14**	**7.01**	**3.60**	**2.97**	**2.55**	**1.68**	**1.22**	**0.87**	**0.62**	**0.48**	**0.37**	**0.26**	**0.20**	**0.15**	**0.11**	**0.08**	**0.06**	**0.04**	**0.03**
2002	0.01	0.52	2.30	3.21	2.98	2.60	2.42	2.43	3.06	2.86	**4.17**	**7.06**	**3.64**	**2.99**	**2.58**	**1.70**	**1.26**	**0.90**	**0.65**	**0.50**	**0.38**	**0.28**	**0.21**	**0.16**	**0.12**	**0.09**	**0.07**	**0.05**	**0.03**	**0.02**
2003	0.01	0.77	1.82	2.09	1.93	1.97	2.14	2.83	2.58	**4.07**	**6.75**	**3.31**	**2.68**	**2.33**	**1.56**	**1.17**	**0.85**	**0.62**	**0.48**	**0.37**	**0.27**	**0.21**	**0.16**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**
2004	0.12	0.96	1.58	1.85	2.19	2.36	3.01	2.83	**4.60**	**7.74**	**3.75**	**3.06**	**2.67**	**1.81**	**1.39**	**1.03**	**0.74**	**0.58**	**0.45**	**0.33**	**0.26**	**0.20**	**0.15**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**
2005	0.11	0.74	1.76	2.52	3.10	3.87	3.60	**5.54**	**9.06**	**4.30**	**3.47**	**3.11**	**2.15**	**1.69**	**1.28**	**0.93**	**0.72**	**0.55**	**0.40**	**0.32**	**0.24**	**0.18**	**0.14**	**0.10**	**0.08**	**0.06**	**0.04**	**0.03**	**0.02**	**0.01**
2006	0.01	0.56	2.17	3.68	5.24	4.64	**6.93**	**10.84**	**5.13**	**4.06**	**3.64**	**2.51**	**1.97**	**1.52**	**1.13**	**0.87**	**0.67**	**0.50**	**0.38**	**0.29**	**0.22**	**0.17**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.01**
2007	0.02	0.79	3.12	5.73	4.91	**8.69**	**13.85**	**6.67**	**4.99**	**4.39**	**2.97**	**2.31**	**1.80**	**1.36**	**1.07**	**0.83**	**0.62**	**0.48**	**0.36**	**0.28**	**0.22**	**0.16**	**0.12**	**0.09**	**0.07**	**0.05**	**0.03**	**0.02**	**0.02**	**0.01**
2008	0.01	0.66	3.33	4.08	**7.53**	**12.00**	**6.20**	**4.26**	**3.60**	**2.39**	**1.84**	**1.44**	**1.11**	**0.89**	**0.70**	**0.53**	**0.42**	**0.32**	**0.25**	**0.20**	**0.15**	**0.11**	**0.09**	**0.06**	**0.05**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**
2009	0.01	0.44	1.07	**2.57**	**4.53**	**2.16**	**1.83**	**1.63**	**1.14**	**0.92**	**0.74**	**0.58**	**0.48**	**0.40**	**0.30**	**0.24**	**0.19**	**0.15**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.00**
2010	0.00	0.13	**0.79**	**2.03**	**1.14**	**1.16**	**1.15**	**0.87**	**0.72**	**0.59**	**0.48**	**0.41**	**0.34**	**0.26**	**0.21**	**0.17**	**0.13**	**0.11**	**0.08**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**
2011	0.00	**0.17**	**0.95**	**0.77**	**0.89**	**0.95**	**0.74**	**0.63**	**0.52**	**0.42**	**0.36**	**0.31**	**0.24**	**0.19**	**0.16**	**0.13**	**0.11**	**0.08**	**0.07**	**0.05**	**0.04**	**0.03**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**
2012	**0.02**	**0.18**	**0.43**	**0.70**	**0.82**	**0.69**	**0.60**	**0.50**	**0.41**	**0.36**	**0.32**	**0.25**	**0.20**	**0.17**	**0.14**	**0.12**	**0.09**	**0.07**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**
2013	**0.01**	**0.13**	**0.74**	**1.29**	**1.19**	**1.06**	**0.89**	**0.76**	**0.68**	**0.60**	**0.51**	**0.43**	**0.36**	**0.30**	**0.26**	**0.20**	**0.17**	**0.14**	**0.12**	**0.10**	**0.08**	**0.06**	**0.05**	**0.04**	**0.03**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**
2014	**0.01**	**0.26**	**1.34**	**1.84**	**1.84**	**1.62**	**1.41**	**1.32**	**1.16**	**1.02**	**0.90**	**0.76**	**0.65**	**0.56**	**0.45**	**0.39**	**0.34**	**0.28**	**0.25**	**0.20**	**0.16**	**0.14**	**0.11**	**0.08**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.01**
2015	**0.01**	**0.30**	**1.20**	**1.78**	**1.76**	**1.64**	**1.59**	**1.44**	**1.30**	**1.15**	**0.98**	**0.86**	**0.76**	**0.62**	**0.53**	**0.45**	**0.38**	**0.34**	**0.27**	**0.22**	**0.19**	**0.16**	**0.12**	**0.10**	**0.08**	**0.06**	**0.05**	**0.03**	**0.02**	**0.02**
2016	**0.01**	**0.28**	**1.22**	**1.62**	**1.64**	**1.61**	**1.46**	**1.31**	**1.18**	**1.03**	**0.92**	**0.82**	**0.68**	**0.57**	**0.51**	**0.43**	**0.38**	**0.30**	**0.24**	**0.21**	**0.17**	**0.14**	**0.11**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**
2017	**0.01**	**0.33**	**1.17**	**1.50**	**1.52**	**1.44**	**1.33**	**1.23**	**1.08**	**0.98**	**0.87**	**0.73**	**0.62**	**0.55**	**0.47**	**0.40**	**0.32**	**0.26**	**0.23**	**0.19**	**0.15**	**0.13**	**0.11**	**0.08**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**	**0.01**
2018	**0.01**	**0.31**	**1.08**	**1.48**	**1.52**	**1.45**	**1.36**	**1.21**	**1.10**	**0.99**	**0.85**	**0.73**	**0.66**	**0.56**	**0.47**	**0.36**	**0.30**	**0.26**	**0.21**	**0.17**	**0.14**	**0.12**	**0.09**	**0.07**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**	**0.01**
2019	**0.01**	**0.31**	**1.17**	**1.60**	**1.60**	**1.53**	**1.40**	**1.29**	**1.20**	**1.04**	**0.92**	**0.84**	**0.73**	**0.60**	**0.46**	**0.38**	**0.33**	**0.26**	**0.21**	**0.18**	**0.16**	**0.12**	**0.10**	**0.08**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**	**0.01**

Conditional Prepayment Rates Fixed Rate 30 Year Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1983	0.36	0.83	2.13	19.22	29.73	12.56	9.59	11.44	13.87	22.41	22.72	23.28	9.29	10.59	9.07	10.51	13.36	6.35	5.52	6.35	5.93	5.18	3.68	2.70	2.09	1.69	1.21	1.26	1.38	**1.58**
1984	0.27	1.49	21.42	29.35	13.74	11.14	12.15	12.77	19.21	20.62	22.21	9.21	10.29	8.87	10.32	11.15	6.22	5.55	6.07	6.04	5.10	4.09	6.36	2.19	2.32	3.66	1.65	2.62	**1.43**	**0.04**
1985	0.36	12.26	25.79	12.06	9.86	12.21	14.56	24.73	26.22	25.88	9.70	11.46	9.84	12.31	13.01	7.29	6.79	7.83	7.76	6.47	4.93	9.18	2.76	3.00	6.11	2.19	2.40	**1.37**	**0.07**	**0.06**
1986	0.59	4.02	2.87	3.42	4.85	5.93	15.59	28.59	27.52	8.03	12.35	10.42	17.28	19.23	10.19	12.30	17.00	19.05	15.08	10.96	13.82	6.28	4.87	6.22	3.63	3.87	**2.93**	**0.37**	**0.32**	**0.23**
1987	0.26	0.94	1.80	3.02	3.60	9.23	21.15	22.46	6.87	10.75	9.25	16.24	19.47	10.26	13.39	19.27	24.37	18.71	13.98	15.74	7.77	6.40	6.73	5.18	5.29	**4.21**	**0.76**	**0.63**	**0.49**	**0.34**
1988	0.30	1.32	3.18	4.92	15.81	29.75	28.25	8.29	12.69	10.52	16.60	19.24	10.77	12.70	17.22	19.41	16.42	12.28	15.44	6.90	5.16	4.86	3.60	4.80	**2.79**	**0.49**	**0.42**	**0.33**	**0.24**	**0.16**
1989	0.32	1.85	4.37	16.81	32.16	30.23	8.50	12.92	10.54	17.14	19.68	10.97	13.24	18.44	20.59	17.90	13.49	16.37	7.14	5.16	4.75	3.48	4.68	**2.98**	**0.58**	**0.49**	**0.40**	**0.31**	**0.22**	**0.16**
1990	0.27	1.63	10.35	33.66	32.57	8.50	13.23	10.50	17.76	20.69	10.97	13.90	20.28	23.13	19.58	14.57	19.88	8.26	6.13	5.89	4.15	4.85	**3.47**	**0.76**	**0.65**	**0.53**	**0.41**	**0.31**	**0.24**	**0.19**
1991	0.29	5.14	29.49	33.27	7.88	13.34	10.53	18.91	21.69	10.79	14.85	21.75	26.23	21.79	15.99	19.25	8.90	6.36	6.44	4.19	4.72	**3.60**	**0.96**	**0.81**	**0.67**	**0.53**	**0.41**	**0.32**	**0.28**	**0.21**
1992	0.37	8.11	18.40	6.10	10.82	9.39	18.75	23.08	10.71	16.50	25.12	33.95	26.95	19.77	15.75	11.24	8.18	6.76	5.52	5.04	**4.61**	**1.75**	**1.41**	**1.20**	**0.99**	**0.78**	**0.64**	**0.58**	**0.50**	**0.38**
1993	0.63	4.14	3.74	7.06	7.24	13.31	17.95	10.16	15.65	25.12	40.43	30.70	23.09	16.88	12.35	9.24	7.89	6.65	6.01	**6.08**	**2.74**	**2.14**	**1.89**	**1.60**	**1.29**	**1.08**	**1.03**	**0.92**	**0.76**	**0.61**
1994	0.27	1.91	6.16	6.20	12.27	15.62	9.23	14.52	22.49	38.14	29.27	22.81	16.85	12.33	9.13	7.34	6.40	6.12	**6.79**	**3.42**	**2.56**	**2.31**	**2.01**	**1.63**	**1.37**	**1.32**	**1.20**	**1.02**	**0.87**	**0.60**
1995	2.01	9.46	7.32	17.93	20.17	9.57	16.26	24.67	34.93	28.81	23.33	18.07	13.07	8.64	5.99	5.33	4.90	**5.03**	**2.61**	**2.08**	**1.83**	**1.53**	**1.22**	**1.01**	**0.95**	**0.84**	**0.72**	**0.63**	**0.49**	**0.39**
1996	0.38	2.75	12.65	17.34	8.59	15.83	24.77	37.25	30.02	24.67	18.64	13.44	9.14	6.68	5.37	5.08	**5.76**	**3.19**	**2.49**	**2.23**	**1.90**	**1.56**	**1.31**	**1.25**	**1.13**	**0.97**	**0.86**	**0.70**	**0.59**	**0.45**
1997	0.71	11.17	18.61	7.96	16.23	25.36	36.81	29.81	24.30	18.24	12.85	9.02	6.32	4.96	4.60	**5.46**	**3.34**	**2.64**	**2.35**	**2.01**	**1.62**	**1.35**	**1.29**	**1.17**	**1.01**	**0.89**	**0.73**	**0.63**	**0.53**	**0.42**
1998	0.99	6.21	5.83	13.19	22.47	39.91	31.92	26.04	19.14	13.65	9.48	7.71	5.95	5.22	**6.31**	**4.24**	**3.24**	**2.99**	**2.62**	**2.17**	**1.84**	**1.80**	**1.67**	**1.48**	**1.34**	**1.11**	**0.97**	**0.85**	**0.73**	**0.56**
1999	0.52	2.79	12.10	22.12	38.92	31.48	26.30	19.07	13.66	9.48	7.98	6.17	5.44	**6.77**	**4.59**	**3.48**	**3.27**	**2.92**	**2.44**	**2.08**	**2.06**	**1.93**	**1.73**	**1.58**	**1.31**	**1.16**	**1.02**	**0.90**	**0.74**	**0.57**
2000	0.88	28.79	36.15	39.24	31.01	26.05	18.97	13.52	8.69	6.51	4.67	3.92	**4.91**	**3.27**	**2.71**	**2.50**	**2.17**	**1.77**	**1.48**	**1.43**	**1.31**	**1.15**	**1.03**	**0.85**	**0.74**	**0.64**	**0.56**	**0.48**	**0.40**	**0.31**
2001	5.40	19.79	45.21	33.60	26.82	19.20	13.16	9.34	8.64	5.91	4.89	**5.96**	**3.88**	**3.09**	**2.96**	**2.68**	**2.26**	**1.94**	**1.94**	**1.83**	**1.64**	**1.52**	**1.27**	**1.14**	**1.01**	**0.91**	**0.79**	**0.70**	**0.61**	**0.49**
2002	3.05	36.00	32.26	26.35	17.93	12.78	9.33	9.50	6.84	5.80	**7.06**	**4.41**	**3.36**	**3.36**	**3.16**	**2.72**	**2.37**	**2.41**	**2.32**	**2.14**	**2.00**	**1.70**	**1.55**	**1.40**	**1.26**	**1.10**	**0.99**	**0.89**	**0.76**	**0.60**
2003	6.35	19.33	23.89	16.40	11.77	8.12	8.57	7.01	6.54	**8.40**	**4.89**	**3.50**	**3.76**	**3.76**	**3.34**	**2.94**	**3.05**	**3.04**	**2.90**	**2.75**	**2.34**	**2.19**	**2.03**	**1.84**	**1.64**	**1.51**	**1.38**	**1.22**	**1.05**	**0.83**
2004	5.86	19.70	15.13	10.78	6.99	7.56	6.19	5.91	**8.29**	**4.75**	**3.42**	**3.76**	**3.87**	**3.49**	**3.09**	**3.23**	**3.27**	**3.16**	**3.01**	**2.57**	**2.44**	**2.27**	**2.07**	**1.84**	**1.70**	**1.56**	**1.41**	**1.24**	**1.08**	**0.78**
2005	6.23	9.75	9.02	6.41	7.41	5.90	5.66	**7.73**	**4.05**	**2.89**	**3.31**	**3.51**	**3.22**	**2.88**	**3.06**	**3.15**	**3.10**	**3.00**	**2.58**	**2.48**	**2.33**	**2.13**	**1.92**	**1.79**	**1.66**	**1.52**	**1.37**	**1.27**	**1.08**	**0.80**
2006	1.16	7.29	8.91	12.42	7.67	6.53	**7.90**	**3.49**	**2.41**	**2.89**	**3.11**	**2.89**	**2.59**	**2.80**	**2.89**	**2.85**	**2.80**	**2.43**	**2.32**	**2.18**	**2.00**	**1.81**	**1.68**	**1.57**	**1.44**	**1.30**	**1.23**	**1.08**	**0.89**	**0.75**
2007	1.26	10.93	15.77	8.01	5.92	**6.92**	**3.16**	**2.08**	**2.60**	**2.87**	**2.66**	**2.39**	**2.60**	**2.70**	**2.68**	**2.64**	**2.31**	**2.19**	**2.05**	**1.90**	**1.72**	**1.61**	**1.52**	**1.38**	**1.25**	**1.19**	**1.07**	**0.91**	**0.84**	**0.71**
2008	2.03	22.33	12.66	8.13	**8.82**	**3.47**	**2.14**	**2.82**	**3.24**	**3.05**	**2.75**	**3.02**	**3.19**	**3.19**	**3.14**	**2.73**	**2.61**	**2.44**	**2.27**	**2.07**	**1.93**	**1.82**	**1.67**	**1.52**	**1.45**	**1.31**	**1.12**	**1.06**	**0.99**	**0.84**
2009	6.94	9.23	8.04	**10.80**	**4.40**	**3.23**	**4.03**	**4.83**	**4.65**	**4.28**	**4.65**	**4.98**	**4.95**	**4.81**	**4.11**	**3.99**	**3.76**	**3.50**	**3.14**	**2.98**	**2.77**	**2.57**	**2.39**	**2.26**	**2.05**	**1.72**	**1.66**	**1.58**	**1.45**	**1.07**
2010	1.69	4.94	**11.30**	**5.79**	**4.60**	**5.51**	**6.49**	**6.15**	**5.62**	**6.01**	**6.38**	**6.25**	**6.01**	**5.09**	**4.91**	**4.64**	**4.35**	**3.87**	**3.70**	**3.41**	**3.16**	**2.96**	**2.81**	**2.55**	**2.11**	**2.04**	**1.96**	**1.82**	**1.44**	**1.27**
2011	0.54	**12.42**	**8.75**	**6.55**	**7.71**	**8.72**	**7.94**	**7.07**	**7.59**	**7.99**	**7.73**	**7.37**	**6.11**	**5.82**	**5.58**	**5.22**	**4.63**	**4.46**	**4.08**	**3.77**	**3.54**	**3.43**	**3.07**	**2.50**	**2.43**	**2.32**	**2.15**	**1.73**	**1.68**	**1.26**
2012	**1.70**	**8.48**	**7.75**	**9.72**	**10.56**	**9.30**	**8.22**	**8.76**	**9.29**	**8.97**	**8.37**	**6.82**	**6.53**	**6.30**	**5.91**	**5.21**	**5.04**	**4.57**	**4.20**	**3.94**	**3.82**	**3.43**	**2.77**	**2.73**	**2.56**	**2.35**	**1.91**	**1.93**	**1.62**	**1.30**
2013	**2.95**	**10.76**	**16.13**	**15.28**	**12.67**	**11.17**	**11.74**	**11.48**	**10.69**	**9.82**	**8.01**	**7.40**	**7.14**	**6.48**	**5.69**	**5.31**	**4.71**	**4.45**	**4.16**	**4.15**	**3.91**	**3.16**	**2.95**	**2.79**	**2.48**	**2.05**	**2.02**	**1.70**	**1.48**	**1.11**
2014	**3.77**	**22.82**	**22.76**	**18.19**	**15.22**	**14.57**	**13.01**	**11.72**	**10.51**	**8.64**	**7.88**	**7.30**	**6.42**	**5.89**	**5.38**	**4.66**	**4.15**	**4.07**	**4.16**	**3.79**	**2.84**	**2.51**	**2.36**	**2.15**	**1.70**	**1.60**	**1.30**	**1.20**	**0.93**	**0.65**
2015	**4.42**	**22.34**	**20.86**	**17.85**	**16.81**	**15.17**	**13.95**	**12.73**	**9.87**	**9.12**	**8.07**	**7.36**	**6.56**	**5.93**	**5.23**	**4.67**	**4.58**	**4.58**	**4.04**	**3.10**	**2.79**	**2.53**	**2.06**	**1.52**	**1.80**	**1.40**	**1.26**	**1.01**	**0.77**	**0.56**
2016	**4.27**	**18.34**	**20.02**	**19.66**	**17.19**	**14.72**	**13.38**	**11.04**	**9.99**	**8.70**	**8.40**	**7.62**	**6.64**	**5.91**	**5.68**	**5.19**	**4.71**	**3.88**	**3.11**	**2.94**	**2.88**	**2.40**	**1.86**	**1.88**	**1.67**	**1.41**	**1.09**	**0.92**	**0.82**	**0.72**
2017	**3.89**	**19.27**	**21.34**	**18.30**	**15.14**	**13.82**	**12.17**	**10.50**	**9.10**	**8.60**	**7.96**	**7.00**	**6.28**	**6.15**	**5.58**	**5.25**	**4.00**	**3.42**	**3.34**	**3.23**	**2.73**	**2.09**	**2.06**	**2.05**	**1.67**	**1.30**	**1.10**	**1.08**	**0.96**	**0.72**
2018	**3.55**	**19.69**	**19.73**	**17.08**	**15.81**	**13.34**	**11.44**	**10.55**	**9.30**	**8.52**	**7.42**	**6.71**	**6.55**	**5.85**	**5.26**	**4.09**	**3.47**	**3.32**	**3.31**	**2.74**	**2.01**	**2.04**	**2.00**	**1.51**	**1.26**	**1.18**	**1.19**	**1.08**	**0.90**	**0.88**
2019	**4.50**	**18.26**	**19.85**	**18.19**	**13.94**	**12.39**	**11.81**	**10.08**	**9.30**	**8.53**	**7.51**	**6.98**	**6.30**	**5.37**	**4.30**	**3.55**	**3.71**	**3.65**	**3.09**	**2.18**	**2.16**	**2.02**	**1.62**	**1.48**	**1.48**	**1.53**	**1.40**	**1.14**	**1.24**	**0.88**

Cumulative Claim Rates Fixed Rate 30 Year Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1983	0.02	0.48	1.98	4.08	6.71	9.38	11.29	12.45	13.24	13.85	14.25	14.55	14.74	14.85	14.94	15.01	15.06	15.08	15.10	15.11	15.12	15.13	15.14	15.14	15.14	15.14	15.14	15.15	15.15	**15.15**
1984	0.03	1.03	3.84	7.62	11.29	13.79	15.23	16.13	16.79	17.24	17.58	17.81	17.96	18.08	18.16	18.22	18.26	18.29	18.30	18.32	18.32	18.33	18.33	18.34	18.34	18.34	18.34	18.34	**18.35**	**18.35**
1985	0.02	0.90	3.87	7.76	10.63	12.44	13.71	14.66	15.34	15.80	16.12	16.31	16.47	16.59	16.66	16.73	16.76	16.78	16.80	16.81	16.82	16.82	16.82	16.83	16.83	16.83	16.84	**16.84**	**16.84**	**16.84**
1986	0.01	0.49	2.24	4.33	6.17	7.72	9.01	10.01	10.81	11.39	11.82	12.18	12.44	12.63	12.76	12.84	12.89	12.92	12.95	12.96	12.97	12.98	12.99	12.99	13.00	13.01	**13.01**	**13.02**	**13.02**	**13.02**
1987	0.01	0.38	1.42	2.65	3.84	4.99	5.98	6.85	7.53	8.07	8.54	8.91	9.19	9.38	9.48	9.55	9.61	9.65	9.67	9.69	9.70	9.70	9.72	9.73	9.74	**9.75**	**9.76**	**9.76**	**9.76**	**9.76**
1988	0.01	0.38	1.43	2.84	4.40	5.76	6.92	7.81	8.46	9.01	9.43	9.75	9.96	10.08	10.16	10.22	10.27	10.30	10.32	10.33	10.34	10.35	10.36	10.37	**10.38**	**10.39**	**10.40**	**10.40**	**10.40**	**10.41**
1989	0.01	0.32	1.35	2.85	4.34	5.69	6.69	7.42	8.02	8.45	8.76	8.98	9.09	9.18	9.24	9.29	9.32	9.34	9.35	9.36	9.38	9.39	9.40	**9.42**	**9.43**	**9.44**	**9.44**	**9.44**	**9.44**	**9.44**
1990	0.01	0.29	1.34	2.87	4.33	5.39	6.15	6.81	7.30	7.65	7.88	8.01	8.10	8.17	8.21	8.24	8.26	8.28	8.30	8.31	8.32	8.34	**8.35**	**8.36**	**8.37**	**8.38**	**8.38**	**8.38**	**8.38**	**8.38**
1991	0.01	0.32	1.46	2.87	4.04	4.95	5.76	6.37	6.79	7.07	7.23	7.34	7.41	7.47	7.50	7.53	7.54	7.56	7.57	7.58	7.60	**7.61**	**7.63**	**7.64**	**7.64**	**7.65**	**7.65**	**7.65**	**7.65**	**7.65**
1992	0.01	0.23	1.01	2.04	3.02	4.07	4.97	5.65	6.10	6.38	6.56	6.68	6.75	6.80	6.83	6.85	6.87	6.89	6.91	6.93	**6.95**	**6.98**	**7.00**	**7.01**	**7.01**	**7.02**	**7.02**	**7.02**	**7.02**	**7.02**
1993	0.00	0.16	0.72	1.58	2.68	3.74	4.62	5.23	5.58	5.83	6.00	6.11	6.18	6.22	6.25	6.27	6.29	6.32	6.35	**6.38**	**6.42**	**6.44**	**6.45**	**6.46**	**6.47**	**6.47**	**6.47**	**6.47**	**6.47**	**6.47**
1994	0.00	0.18	0.83	1.93	3.21	4.32	5.08	5.53	5.86	6.09	6.25	6.35	6.40	6.45	6.48	6.51	6.55	6.59	**6.64**	**6.70**	**6.73**	**6.75**	**6.76**	**6.77**	**6.77**	**6.77**	**6.78**	**6.78**	**6.78**	**6.78**
1995	0.00	0.26	1.30	2.91	4.45	5.58	6.32	6.80	7.22	7.48	7.63	7.72	7.78	7.84	7.89	7.95	8.01	**8.06**	**8.14**	**8.18**	**8.21**	**8.23**	**8.24**	**8.25**	**8.25**	**8.26**	**8.26**	**8.26**	**8.26**	**8.26**
1996	0.00	0.28	1.45	3.09	4.49	5.45	6.12	6.68	7.06	7.27	7.39	7.48	7.55	7.62	7.70	7.76	**7.85**	**7.97**	**8.03**	**8.07**	**8.10**	**8.12**	**8.13**	**8.14**	**8.14**	**8.15**	**8.15**	**8.15**	**8.16**	**8.16**
1997	0.01	0.38	1.62	3.04	4.11	4.98	5.71	6.21	6.50	6.68	6.79	6.89	6.98	7.08	7.16	**7.26**	**7.42**	**7.50**	**7.54**	**7.58**	**7.60**	**7.62**	**7.63**	**7.64**	**7.65**	**7.65**	**7.66**	**7.66**	**7.66**	**7.66**
1998	0.01	0.31	1.34	2.43	3.45	4.40	5.02	5.41	5.64	5.80	5.92	6.04	6.18	6.30	**6.44**	**6.67**	**6.78**	**6.84**	**6.89**	**6.93**	**6.95**	**6.96**	**6.98**	**6.98**	**6.99**	**6.99**	**7.00**	**7.00**	**7.00**	**7.00**
1999	0.01	0.36	1.31	2.51	3.85	4.77	5.33	5.64	5.85	6.02	6.18	6.35	6.52	**6.72**	**7.03**	**7.16**	**7.25**	**7.32**	**7.36**	**7.40**	**7.42**	**7.43**	**7.44**	**7.45**	**7.46**	**7.46**	**7.46**	**7.47**	**7.47**	**7.47**
2000	0.01	0.50	1.95	3.79	5.06	5.75	6.14	6.40	6.60	6.77	6.95	7.10	**7.29**	**7.58**	**7.72**	**7.83**	**7.91**	**7.96**	**8.00**	**8.03**	**8.05**	**8.06**	**8.07**	**8.08**	**8.08**	**8.09**	**8.09**	**8.09**	**8.09**	**8.10**
2001	0.01	0.48	1.99	3.55	4.56	5.15	5.54	5.85	6.10	6.37	6.61	**6.91**	**7.36**	**7.57**	**7.73**	**7.86**	**7.94**	**7.99**	**8.03**	**8.06**	**8.08**	**8.09**	**8.10**	**8.11**	**8.12**	**8.12**	**8.13**	**8.13**	**8.13**	**8.13**
2002	0.01	0.52	1.93	3.23	4.07	4.65	5.11	5.51	5.96	6.34	**6.84**	**7.60**	**7.94**	**8.20**	**8.41**	**8.54**	**8.64**	**8.70**	**8.74**	**8.78**	**8.80**	**8.82**	**8.83**	**8.84**	**8.85**	**8.86**	**8.86**	**8.86**	**8.87**	**8.87**
2003	0.01	0.74	2.11	3.27	4.15	4.92	5.67	6.56	7.29	**8.33**	**9.84**	**10.50**	**10.99**	**11.39**	**11.64**	**11.82**	**11.95**	**12.04**	**12.10**	**12.15**	**12.18**	**12.21**	**12.23**	**12.24**	**12.25**	**12.26**	**12.27**	**12.27**	**12.28**	**12.28**
2004	0.12	1.03	2.21	3.36	4.55	5.71	7.05	8.19	**9.88**	**12.35**	**13.40**	**14.19**	**14.84**	**15.24**	**15.54**	**15.75**	**15.89**	**16.00**	**16.08**	**16.14**	**16.18**	**16.21**	**16.24**	**16.25**	**16.27**	**16.28**	**16.29**	**16.29**	**16.30**	**16.30**
2005	0.11	0.80	2.28	4.17	6.29	8.65	10.64	**13.40**	**17.32**	**18.94**	**20.15**	**21.15**	**21.81**	**22.29**	**22.64**	**22.88**	**23.06**	**23.19**	**23.29**	**23.36**	**23.41**	**23.45**	**23.48**	**23.50**	**23.52**	**23.53**	**23.54**	**23.55**	**23.55**	**23.55**
2006	0.01	0.57	2.56	5.55	9.12	11.87	**15.52**	**20.37**	**22.34**	**23.78**	**24.98**	**25.75**	**26.32**	**26.74**	**27.04**	**27.26**	**27.43**	**27.54**	**27.63**	**27.70**	**27.74**	**27.78**	**27.81**	**27.83**	**27.84**	**27.85**	**27.86**	**27.86**	**27.87**	**27.87**
2007	0.02	0.81	3.54	7.60	10.61	**15.34**	**21.70**	**24.23**	**25.97**	**27.37**	**28.25**	**28.90**	**29.38**	**29.73**	**29.99**	**30.19**	**30.33**	**30.44**	**30.51**	**30.57**	**30.62**	**30.65**	**30.67**	**30.69**	**30.70**	**30.71**	**30.72**	**30.73**	**30.73**	**30.73**
2008	0.01	0.66	3.19	5.78	**9.99**	**15.58**	**18.01**	**19.55**	**20.75**	**21.50**	**22.04**	**22.44**	**22.74**	**22.97**	**23.14**	**23.27**	**23.36**	**23.43**	**23.49**	**23.53**	**23.56**	**23.58**	**23.60**	**23.61**	**23.62**	**23.63**	**23.63**	**23.64**	**23.64**	**23.64**
2009	0.01	0.43	1.33	**3.31**	**6.31**	**7.61**	**8.66**	**9.53**	**10.11**	**10.54**	**10.87**	**11.11**	**11.31**	**11.46**	**11.56**	**11.65**	**11.71**	**11.75**	**11.79**	**11.82**	**11.84**	**11.85**	**11.86**	**11.87**	**11.88**	**11.88**	**11.88**	**11.89**	**11.89**	**11.89**
2010	0.00	0.13	**0.87**	**2.55**	**3.42**	**4.25**	**5.01**	**5.55**	**5.96**	**6.28**	**6.52**	**6.71**	**6.85**	**6.96**	**7.04**	**7.10**	**7.15**	**7.19**	**7.21**	**7.23**	**7.25**	**7.26**	**7.27**	**7.28**	**7.28**	**7.28**	**7.29**	**7.29**	**7.29**	**7.29**
2011	0.00	**0.17**	**1.00**	**1.61**	**2.26**	**2.89**	**3.34**	**3.69**	**3.95**	**4.14**	**4.30**	**4.42**	**4.51**	**4.57**	**4.62**	**4.66**	**4.69**	**4.71**	**4.73**	**4.74**	**4.75**	**4.76**	**4.77**	**4.77**	**4.77**	**4.78**	**4.78**	**4.78**	**4.78**	**4.78**
2012	**0.02**	**0.20**	**0.59**	**1.17**	**1.78**	**2.23**	**2.58**	**2.84**	**3.04**	**3.20**	**3.33**	**3.42**	**3.49**	**3.54**	**3.58**	**3.61**	**3.63**	**3.65**	**3.67**	**3.68**	**3.69**	**3.69**	**3.70**	**3.70**	**3.70**	**3.71**	**3.71**	**3.71**	**3.71**	**3.71**
2013	**0.01**	**0.13**	**0.78**	**1.70**	**2.41**	**2.96**	**3.36**	**3.66**	**3.89**	**4.07**	**4.21**	**4.32**	**4.40**	**4.46**	**4.51**	**4.55**	**4.57**	**4.60**	**4.62**	**4.63**	**4.64**	**4.65**	**4.66**	**4.66**	**4.67**	**4.67**	**4.67**	**4.67**	**4.67**	**4.68**
2014	**0.01**	**0.26**	**1.25**	**2.28**	**3.10**	**3.71**	**4.14**	**4.49**	**4.76**	**4.97**	**5.13**	**5.26**	**5.36**	**5.44**	**5.50**	**5.55**	**5.59**	**5.62**	**5.65**	**5.67**	**5.68**	**5.69**	**5.70**	**5.71**	**5.72**	**5.72**	**5.73**	**5.73**	**5.73**	**5.73**
2015	**0.01**	**0.30**	**1.19**	**2.21**	**3.03**	**3.64**	**4.14**	**4.52**	**4.81**	**5.04**	**5.22**	**5.36**	**5.47**	**5.56**	**5.62**	**5.68**	**5.72**	**5.76**	**5.78**	**5.81**	**5.82**	**5.84**	**5.85**	**5.86**	**5.86**	**5.87**	**5.87**	**5.88**	**5.88**	**5.88**
2016	**0.01**	**0.28**	**1.23**	**2.23**	**3.02**	**3.64**	**4.12**	**4.48**	**4.77**	**4.99**	**5.17**	**5.31**	**5.42**	**5.50**	**5.57**	**5.63**	**5.67**	**5.71**	**5.73**	**5.76**	**5.77**	**5.79**	**5.80**	**5.81**	**5.81**	**5.82**	**5.82**	**5.82**	**5.82**	**5.83**
2017	**0.01**	**0.33**	**1.23**	**2.13**	**2.86**	**3.43**	**3.88**	**4.24**	**4.51**	**4.74**	**4.92**	**5.05**	**5.16**	**5.25**	**5.32**	**5.37**	**5.42**	**5.45**	**5.47**	**5.50**	**5.51**	**5.53**	**5.54**	**5.54**	**5.55**	**5.56**	**5.56**	**5.56**	**5.56**	**5.57**
2018	**0.01**	**0.31**	**1.14**	**2.05**	**2.80**	**3.39**	**3.86**	**4.23**	**4.52**	**4.76**	**4.94**	**5.08**	**5.20**	**5.30**	**5.37**	**5.42**	**5.46**	**5.50**	**5.53**	**5.55**	**5.56**	**5.58**	**5.59**	**5.60**	**5.60**	**5.61**	**5.61**	**5.61**	**5.62**	**5.62**
2019	**0.01**	**0.31**	**1.22**	**2.20**	**2.99**	**3.62**	**4.12**	**4.52**	**4.85**	**5.10**	**5.30**	**5.47**	**5.61**	**5.71**	**5.78**	**5.84**	**5.88**	**5.92**	**5.95**	**5.97**	**5.99**	**6.00**	**6.02**	**6.02**	**6.03**	**6.04**	**6.04**	**6.04**	**6.05**	**6.05**

Cumulative Prepayment Rates Fixed Rate 30 Year Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1983	0.36	1.19	3.29	21.54	43.68	49.92	53.83	57.83	61.96	67.54	71.79	75.05	76.02	77.01	77.75	78.53	79.40	79.76	80.06	80.42	80.77	80.99	81.14	81.25	81.34	81.47	81.51	81.56	81.61	**81.68**
1984	0.27	1.77	22.61	44.21	50.84	55.06	58.84	62.16	66.34	69.85	72.73	73.63	74.51	75.19	75.89	76.56	76.89	77.17	77.47	77.78	78.04	78.20	78.42	78.49	78.60	78.78	78.83	78.92	**78.96**	**78.96**
1985	0.36	12.60	34.93	42.32	47.25	52.39	57.52	64.66	70.10	73.88	74.89	75.92	76.69	77.54	78.31	78.68	79.00	79.34	79.66	79.91	80.12	80.40	80.48	80.56	80.75	80.83	80.89	**80.92**	**80.93**	**80.93**
1986	0.59	4.60	7.33	10.43	14.57	19.28	30.68	47.99	59.57	61.96	65.26	67.67	71.18	74.35	75.69	77.13	78.85	80.45	81.47	82.10	82.85	83.12	83.32	83.56	83.70	83.88	**83.97**	**83.99**	**84.00**	**84.01**
1987	0.26	1.20	2.98	5.87	9.18	17.22	33.72	47.28	50.44	54.98	58.42	63.82	69.16	71.40	74.00	77.22	80.48	82.36	83.50	84.61	85.11	85.45	85.79	86.04	86.31	**86.53**	**86.56**	**86.59**	**86.61**	**86.63**
1988	0.30	1.63	4.75	9.38	23.29	44.85	58.82	61.67	65.55	68.30	72.09	75.66	77.24	78.88	80.79	82.57	83.76	84.50	85.31	85.63	85.88	86.07	86.21	86.39	**86.49**	**86.51**	**86.52**	**86.53**	**86.54**	**86.55**
1989	0.32	2.17	6.44	21.97	46.19	61.16	63.98	67.78	70.41	74.12	77.57	79.07	80.67	82.57	84.29	85.45	86.17	86.91	87.18	87.38	87.56	87.67	87.82	**87.91**	**87.93**	**87.94**	**87.95**	**87.96**	**87.97**	**87.98**
1990	0.27	1.90	12.05	41.26	59.46	62.55	66.80	69.65	73.85	77.76	79.37	81.16	83.37	85.36	86.64	87.39	88.26	88.55	88.75	88.94	89.08	89.21	**89.30**	**89.32**	**89.34**	**89.35**	**89.36**	**89.37**	**89.37**	**89.38**
1991	0.29	5.44	33.31	55.03	58.36	63.39	66.73	71.96	76.67	78.47	80.63	83.29	85.77	87.26	88.11	88.96	89.27	89.48	89.67	89.80	89.95	**90.04**	**90.06**	**90.08**	**90.10**	**90.11**	**90.12**	**90.13**	**90.14**	**90.14**
1992	0.37	8.49	25.31	29.83	37.23	42.86	52.85	62.62	66.04	70.67	76.46	82.27	85.26	86.85	87.86	88.46	88.85	89.14	89.37	89.57	**89.75**	**89.81**	**89.86**	**89.90**	**89.93**	**89.96**	**89.98**	**90.00**	**90.02**	**90.03**
1993	0.64	4.76	8.33	14.78	20.87	31.10	42.85	48.22	55.56	65.38	77.10	82.32	85.01	86.51	87.42	88.01	88.47	88.83	89.13	**89.41**	**89.53**	**89.62**	**89.70**	**89.76**	**89.81**	**89.86**	**89.90**	**89.93**	**89.96**	**89.99**
1994	0.27	2.19	8.21	13.88	24.23	35.59	41.17	49.01	59.28	72.66	78.92	82.32	84.24	85.40	86.16	86.71	87.15	87.55	**87.96**	**88.15**	**88.29**	**88.41**	**88.51**	**88.60**	**88.66**	**88.73**	**88.79**	**88.84**	**88.89**	**88.93**
1995	2.01	11.30	17.80	32.35	45.44	50.25	57.47	66.44	75.84	80.75	83.51	85.12	86.06	86.59	86.93	87.21	87.46	**87.69**	**87.81**	**87.90**	**87.97**	**88.03**	**88.08**	**88.12**	**88.16**	**88.19**	**88.22**	**88.24**	**88.26**	**88.28**
1996	0.38	3.13	15.39	29.84	35.63	45.15	57.44	71.09	77.79	81.55	83.65	84.86	85.57	86.03	86.38	86.69	**87.01**	**87.18**	**87.31**	**87.42**	**87.51**	**87.58**	**87.64**	**87.69**	**87.74**	**87.79**	**87.82**	**87.86**	**87.88**	**87.91**
1997	0.71	11.85	28.22	33.83	44.12	57.30	71.25	78.14	81.96	84.08	85.27	85.99	86.45	86.78	87.07	**87.39**	**87.57**	**87.71**	**87.83**	**87.92**	**88.00**	**88.06**	**88.12**	**88.17**	**88.22**	**88.26**	**88.29**	**88.32**	**88.35**	**88.37**
1998	0.99	7.17	12.59	24.00	40.60	63.04	73.48	79.10	82.08	83.77	84.77	85.49	86.00	86.42	**86.88**	**87.17**	**87.38**	**87.56**	**87.71**	**87.83**	**87.93**	**88.03**	**88.11**	**88.19**	**88.26**	**88.32**	**88.36**	**88.41**	**88.45**	**88.48**
1999	0.52	3.31	15.01	33.57	58.56	70.44	76.99	80.38	82.30	83.43	84.28	84.88	85.36	**85.92**	**86.26**	**86.50**	**86.71**	**86.90**	**87.04**	**87.16**	**87.28**	**87.38**	**87.48**	**87.56**	**87.63**	**87.69**	**87.75**	**87.80**	**87.84**	**87.88**
2000	0.88	29.50	54.86	71.86	79.43	83.49	85.54	86.67	87.27	87.68	87.94	88.14	**88.38**	**88.52**	**88.63**	**88.73**	**88.80**	**88.86**	**88.91**	**88.96**	**89.00**	**89.04**	**89.07**	**89.09**	**89.12**	**89.14**	**89.16**	**89.17**	**89.18**	**89.20**
2001	5.42	24.22	58.39	71.74	78.40	81.68	83.42	84.46	85.30	85.82	86.20	**86.64**	**86.89**	**87.07**	**87.24**	**87.37**	**87.49**	**87.58**	**87.67**	**87.75**	**87.82**	**87.88**	**87.94**	**87.98**	**88.03**	**88.06**	**88.10**	**88.13**	**88.15**	**88.17**
2002	3.06	38.12	57.99	68.59	73.66	76.53	78.29	79.88	80.89	81.66	**82.51**	**82.99**	**83.31**	**83.61**	**83.88**	**84.09**	**84.27**	**84.45**	**84.61**	**84.76**	**84.89**	**85.00**	**85.10**	**85.19**	**85.27**	**85.34**	**85.40**	**85.46**	**85.51**	**85.55**
2003	6.39	24.58	42.50	51.62	56.96	60.14	63.16	65.36	67.21	**69.37**	**70.48**	**71.17**	**71.88**	**72.53**	**73.08**	**73.54**	**73.99**	**74.43**	**74.84**	**75.21**	**75.51**	**75.79**	**76.04**	**76.27**	**76.46**	**76.64**	**76.81**	**76.96**	**77.09**	**77.21**
2004	5.91	24.52	35.83	42.55	46.35	50.09	52.84	55.23	**58.29**	**59.82**	**60.78**	**61.77**	**62.71**	**63.51**	**64.18**	**64.85**	**65.51**	**66.11**	**66.67**	**67.13**	**67.55**	**67.93**	**68.26**	**68.56**	**68.83**	**69.08**	**69.30**	**69.50**	**69.69**	**69.84**
2005	6.34	15.51	23.10	27.92	32.98	36.59	39.70	**43.57**	**45.33**	**46.42**	**47.58**	**48.73**	**49.71**	**50.55**	**51.40**	**52.23**	**53.02**	**53.76**	**54.37**	**54.95**	**55.46**	**55.93**	**56.33**	**56.71**	**57.05**	**57.37**	**57.65**	**57.91**	**58.14**	**58.34**
2006	1.16	8.40	16.53	26.62	31.84	35.72	**39.88**	**41.45**	**42.38**	**43.41**	**44.44**	**45.34**	**46.10**	**46.88**	**47.66**	**48.39**	**49.09**	**49.67**	**50.22**	**50.71**	**51.16**	**51.56**	**51.92**	**52.25**	**52.56**	**52.83**	**53.09**	**53.32**	**53.52**	**53.72**
2007	1.27	12.09	25.88	31.56	35.17	**38.95**	**40.40**	**41.20**	**42.10**	**43.03**	**43.82**	**44.50**	**45.20**	**45.89**	**46.56**	**47.19**	**47.72**	**48.21**	**48.66**	**49.07**	**49.43**	**49.77**	**50.08**	**50.35**	**50.61**	**50.84**	**51.06**	**51.25**	**51.42**	**51.60**
2008	2.04	24.00	33.56	38.72	**43.64**	**45.26**	**46.10**	**47.12**	**48.21**	**49.17**	**49.98**	**50.84**	**51.70**	**52.53**	**53.31**	**53.96**	**54.57**	**55.12**	**55.62**	**56.06**	**56.47**	**56.85**	**57.19**	**57.49**	**57.78**	**58.04**	**58.26**	**58.48**	**58.68**	**58.88**
2009	6.98	15.61	22.39	**30.66**	**33.58**	**35.54**	**37.85**	**40.46**	**42.80**	**44.84**	**46.95**	**49.08**	**51.08**	**52.91**	**54.40**	**55.79**	**57.04**	**58.16**	**59.13**	**60.03**	**60.83**	**61.56**	**62.22**	**62.83**	**63.38**	**63.83**	**64.27**	**64.69**	**65.08**	**65.41**
2010	1.71	6.59	**17.19**	**21.96**	**25.45**	**29.41**	**33.75**	**37.55**	**40.78**	**44.02**	**47.23**	**50.16**	**52.78**	**54.87**	**56.77**	**58.49**	**60.01**	**61.31**	**62.51**	**63.57**	**64.52**	**65.38**	**66.18**	**66.89**	**67.47**	**68.02**	**68.54**	**69.03**	**69.42**	**69.83**
2011	0.54	**12.96**	**20.60**	**25.77**	**31.41**	**37.23**	**42.03**	**45.92**	**49.79**	**53.52**	**56.83**	**59.73**	**61.95**	**63.93**	**65.72**	**67.30**	**68.62**	**69.84**	**70.90**	**71.85**	**72.70**	**73.50**	**74.20**	**74.75**	**75.27**	**75.77**	**76.22**	**76.59**	**76.96**	**77.28**
2012	**1.71**	**10.10**	**17.09**	**25.14**	**32.98**	**39.09**	**43.95**	**48.68**	**53.23**	**57.19**	**60.54**	**63.04**	**65.26**	**67.26**	**69.01**	**70.46**	**71.79**	**72.94**	**73.95**	**74.85**	**75.69**	**76.42**	**76.99**	**77.54**	**78.05**	**78.50**	**78.87**	**79.25**	**79.57**	**79.86**
2013	**2.96**	**13.45**	**27.44**	**38.45**	**46.05**	**51.83**	**57.16**	**61.72**	**65.45**	**68.49**	**70.70**	**72.59**	**74.26**	**75.66**	**76.81**	**77.81**	**78.65**	**79.42**	**80.10**	**80.75**	**81.35**	**81.81**	**82.23**	**82.62**	**82.95**	**83.23**	**83.49**	**83.72**	**83.93**	**84.11**
2014	**3.78**	**25.83**	**42.71**	**52.94**	**59.78**	**65.21**	**69.27**	**72.41**	**74.86**	**76.63**	**78.10**	**79.34**	**80.34**	**81.20**	**81.93**	**82.53**	**83.03**	**83.51**	**83.98**	**84.39**	**84.69**	**84.94**	**85.18**	**85.38**	**85.55**	**85.70**	**85.83**	**85.95**	**86.05**	**86.13**
2015	**4.44**	**25.88**	**41.34**	**51.65**	**59.43**	**65.16**	**69.54**	**72.91**	**75.16**	**76.99**	**78.45**	**79.66**	**80.65**	**81.48**	**82.17**	**82.75**	**83.29**	**83.81**	**84.25**	**84.57**	**84.86**	**85.11**	**85.31**	**85.46**	**85.64**	**85.77**	**85.90**	**86.00**	**86.08**	**86.15**
2016	**4.30**	**21.94**	**37.58**	**49.66**	**57.97**	**63.74**	**68.12**	**71.20**	**73.64**	**75.53**	**77.17**	**78.53**	**79.61**	**80.50**	**81.31**	**82.00**	**82.59**	**83.05**	**83.41**	**83.73**	**84.05**	**84.30**	**84.49**	**84.69**	**84.86**	**85.00**	**85.11**	**85.21**	**85.30**	**85.40**
2017	**3.91**	**22.52**	**39.06**	**50.03**	**57.29**	**62.82**	**66.94**	**70.01**	**72.36**	**74.35**	**76.03**	**77.36**	**78.47**	**79.49**	**80.35**	**81.10**	**81.63**	**82.08**	**82.51**	**82.90**	**83.22**	**83.46**	**83.69**	**83.93**	**84.12**	**84.26**	**84.39**	**84.52**	**84.64**	**84.75**
2018	**3.57**	**22.66**	**37.91**	**48.34**	**56.20**	**61.68**	**65.68**	**68.90**	**71.39**	**73.45**	**75.06**	**76.40**	**77.61**	**78.61**	**79.44**	**80.05**	**80.55**	**81.02**	**81.47**	**81.83**	**82.09**	**82.34**	**82.60**	**82.78**	**82.94**	**83.09**	**83.24**	**83.39**	**83.51**	**83.65**
2019	**4.53**	**22.05**	**37.52**	**48.70**	**55.55**	**60.69**	**64.92**	**68.03**	**70.59**	**72.69**	**74.35**	**75.77**	**76.95**	**77.88**	**78.59**	**79.15**	**79.72**	**80.27**	**80.72**	**81.02**	**81.32**	**81.58**	**81.80**	**81.99**	**82.19**	**82.40**	**82.60**	**82.75**	**82.94**	**83.09**

Conditional Claim Rates Fixed Rate 30 Year Streamline Refinance Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1992	0.00	0.24	0.73	1.03	1.06	1.07	0.91	1.01	0.77	0.46	0.30	0.27	0.39	0.18	0.47	0.16	0.02	0.39	0.03	0.33	**0.66**	**0.94**	**0.58**	**0.56**	**0.59**	**0.46**	**0.41**	**0.35**	**0.31**	**0.26**
1993	0.01	0.20	0.71	1.08	1.55	1.42	1.16	0.88	0.47	0.35	0.29	0.29	0.21	0.11	0.12	0.15	0.17	0.26	0.29	**0.42**	**1.03**	**0.54**	**0.46**	**0.42**	**0.31**	**0.26**	**0.21**	**0.18**	**0.16**	**0.12**
1994	0.01	0.32	0.79	1.15	1.27	1.06	0.80	0.51	0.37	0.31	0.29	0.27	0.18	0.16	0.14	0.16	0.39	0.25	**0.54**	**1.06**	**0.52**	**0.47**	**0.44**	**0.32**	**0.26**	**0.22**	**0.19**	**0.17**	**0.14**	**0.11**
1995	0.02	0.42	1.40	2.00	1.83	1.80	1.20	0.83	0.86	0.93	0.66	0.76	0.71	0.08	0.28	0.81	1.11	**1.23**	**2.13**	**1.40**	**1.35**	**1.40**	**1.05**	**0.90**	**0.79**	**0.71**	**0.67**	**0.58**	**0.47**	**0.37**
1996	0.02	0.50	1.47	1.84	1.63	0.91	0.68	0.71	0.73	0.58	0.73	0.41	0.44	0.40	0.89	0.44	**1.33**	**2.53**	**1.22**	**1.12**	**1.06**	**0.76**	**0.62**	**0.50**	**0.44**	**0.40**	**0.35**	**0.31**	**0.27**	**0.21**
1997	0.02	0.63	1.74	2.15	1.46	1.06	1.06	0.99	0.86	0.74	0.66	0.81	0.83	0.88	1.14	**1.61**	**2.93**	**1.38**	**1.50**	**1.42**	**1.05**	**0.89**	**0.75**	**0.65**	**0.62**	**0.54**	**0.46**	**0.42**	**0.36**	**0.28**
1998	0.00	0.22	0.79	0.80	0.71	0.79	1.12	0.92	0.72	0.61	0.59	0.78	1.03	0.99	**1.64**	**3.37**	**1.55**	**1.28**	**1.15**	**0.80**	**0.64**	**0.51**	**0.43**	**0.39**	**0.34**	**0.29**	**0.25**	**0.22**	**0.18**	**0.15**
1999	0.01	0.25	0.50	0.64	0.80	0.94	0.94	0.75	0.55	0.68	0.73	0.84	0.88	**1.88**	**3.49**	**1.53**	**1.22**	**1.06**	**0.73**	**0.58**	**0.46**	**0.38**	**0.34**	**0.30**	**0.25**	**0.22**	**0.19**	**0.16**	**0.14**	**0.10**
2000	0.02	0.36	1.18	1.94	3.19	2.79	1.72	1.63	1.94	1.10	1.38	2.27	**3.01**	**5.98**	**3.17**	**2.72**	**2.58**	**1.82**	**1.48**	**1.23**	**1.04**	**0.96**	**0.86**	**0.76**	**0.71**	**0.66**	**0.59**	**0.52**	**0.42**	**0.32**
2001	0.00	0.20	1.27	2.70	2.91	2.85	2.32	2.44	2.48	3.40	3.30	**5.90**	**10.05**	**4.12**	**3.48**	**2.85**	**1.90**	**1.51**	**1.19**	**0.97**	**0.85**	**0.72**	**0.60**	**0.52**	**0.44**	**0.37**	**0.33**	**0.26**	**0.22**	**0.17**
2002	0.01	0.41	1.80	2.23	2.02	1.75	1.77	1.90	2.40	2.45	**4.59**	**7.82**	**3.22**	**2.75**	**2.28**	**1.53**	**1.22**	**0.96**	**0.78**	**0.68**	**0.58**	**0.48**	**0.41**	**0.35**	**0.30**	**0.26**	**0.21**	**0.18**	**0.15**	**0.11**
2003	0.01	0.56	1.26	1.26	1.21	1.33	1.52	2.11	1.98	**4.08**	**6.56**	**2.54**	**2.07**	**1.69**	**1.13**	**0.91**	**0.71**	**0.57**	**0.50**	**0.42**	**0.34**	**0.30**	**0.25**	**0.21**	**0.18**	**0.15**	**0.13**	**0.11**	**0.09**	**0.06**
2004	0.14	0.84	1.13	1.17	1.38	1.58	2.19	2.14	**4.16**	**6.45**	**2.48**	**1.97**	**1.59**	**1.06**	**0.86**	**0.67**	**0.53**	**0.46**	**0.39**	**0.32**	**0.27**	**0.23**	**0.20**	**0.17**	**0.14**	**0.12**	**0.10**	**0.08**	**0.07**	**0.05**
2005	0.11	0.66	1.57	2.03	2.48	3.22	3.13	**4.54**	**7.11**	**3.36**	**2.61**	**2.22**	**1.49**	**1.13**	**0.85**	**0.67**	**0.56**	**0.46**	**0.37**	**0.31**	**0.26**	**0.22**	**0.19**	**0.15**	**0.13**	**0.11**	**0.09**	**0.08**	**0.06**	**0.04**
2006	0.06	1.04	2.30	3.31	4.54	4.07	**6.19**	**9.14**	**4.69**	**3.74**	**3.21**	**2.09**	**1.56**	**1.15**	**0.89**	**0.75**	**0.61**	**0.48**	**0.40**	**0.34**	**0.28**	**0.24**	**0.20**	**0.17**	**0.14**	**0.12**	**0.10**	**0.08**	**0.06**	**0.05**
2007	0.05	1.11	4.16	6.48	5.85	**9.93**	**15.53**	**7.95**	**6.02**	**4.85**	**2.99**	**2.17**	**1.58**	**1.22**	**1.01**	**0.80**	**0.64**	**0.53**	**0.44**	**0.36**	**0.31**	**0.25**	**0.21**	**0.18**	**0.14**	**0.12**	**0.09**	**0.07**	**0.06**	**0.04**
2008	0.02	1.33	5.35	5.30	**9.69**	**15.42**	**8.28**	**5.57**	**4.39**	**2.63**	**1.87**	**1.36**	**1.03**	**0.84**	**0.68**	**0.53**	**0.44**	**0.36**	**0.30**	**0.25**	**0.20**	**0.17**	**0.14**	**0.11**	**0.09**	**0.08**	**0.06**	**0.05**	**0.04**	**0.03**
2009	0.02	0.84	2.43	**4.95**	**7.75**	**3.51**	**2.69**	**1.99**	**1.15**	**0.83**	**0.62**	**0.47**	**0.39**	**0.32**	**0.25**	**0.20**	**0.17**	**0.14**	**0.12**	**0.09**	**0.08**	**0.07**	**0.05**	**0.04**	**0.04**	**0.03**	**0.03**	**0.02**	**0.02**	**0.01**
2010	0.04	0.78	**2.47**	**4.43**	**2.19**	**2.04**	**1.60**	**0.95**	**0.70**	**0.52**	**0.41**	**0.34**	**0.28**	**0.22**	**0.18**	**0.15**	**0.13**	**0.11**	**0.08**	**0.07**	**0.06**	**0.05**	**0.04**	**0.03**	**0.03**	**0.02**	**0.02**	**0.02**	**0.01**	**0.01**
2011	0.05	**0.71**	**2.11**	**1.48**	**1.58**	**1.33**	**0.83**	**0.62**	**0.46**	**0.36**	**0.30**	**0.25**	**0.20**	**0.16**	**0.14**	**0.11**	**0.10**	**0.08**	**0.07**	**0.06**	**0.05**	**0.04**	**0.03**	**0.03**	**0.02**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**
2012	**0.04**	**0.57**	**0.98**	**1.45**	**1.44**	**0.98**	**0.76**	**0.57**	**0.44**	**0.38**	**0.31**	**0.25**	**0.20**	**0.17**	**0.14**	**0.12**	**0.10**	**0.08**	**0.07**	**0.06**	**0.05**	**0.04**	**0.04**	**0.03**	**0.03**	**0.02**	**0.02**	**0.02**	**0.01**	**0.01**
2013	**0.03**	**0.40**	**1.56**	**2.20**	**1.72**	**1.32**	**0.99**	**0.79**	**0.69**	**0.56**	**0.46**	**0.39**	**0.33**	**0.28**	**0.24**	**0.19**	**0.16**	**0.15**	**0.12**	**0.11**	**0.09**	**0.08**	**0.07**	**0.06**	**0.05**	**0.05**	**0.04**	**0.03**	**0.03**	**0.02**
2014	**0.02**	**0.57**	**2.07**	**2.30**	**1.91**	**1.46**	**1.16**	**1.05**	**0.85**	**0.72**	**0.62**	**0.52**	**0.44**	**0.37**	**0.30**	**0.28**	**0.25**	**0.20**	**0.19**	**0.17**	**0.15**	**0.13**	**0.12**	**0.10**	**0.09**	**0.08**	**0.07**	**0.06**	**0.05**	**0.04**
2015	**0.03**	**0.57**	**1.64**	**1.98**	**1.72**	**1.50**	**1.38**	**1.17**	**1.04**	**0.83**	**0.69**	**0.65**	**0.57**	**0.48**	**0.42**	**0.37**	**0.32**	**0.33**	**0.30**	**0.27**	**0.27**	**0.24**	**0.21**	**0.20**	**0.20**	**0.18**	**0.17**	**0.16**	**0.13**	**0.12**
2016	**0.02**	**0.44**	**1.42**	**1.70**	**1.58**	**1.46**	**1.26**	**1.02**	**0.87**	**0.76**	**0.66**	**0.56**	**0.46**	**0.41**	**0.38**	**0.35**	**0.30**	**0.26**	**0.23**	**0.22**	**0.20**	**0.17**	**0.16**	**0.15**	**0.13**	**0.14**	**0.12**	**0.10**	**0.10**	**0.08**
2017	**0.02**	**0.46**	**1.27**	**1.42**	**1.27**	**1.12**	**0.90**	**0.78**	**0.65**	**0.57**	**0.46**	**0.37**	**0.29**	**0.28**	**0.26**	**0.21**	**0.17**	**0.15**	**0.14**	**0.13**	**0.11**	**0.10**	**0.10**	**0.08**	**0.08**	**0.07**	**0.06**	**0.06**	**0.05**	**0.04**
2018	**0.03**	**0.44**	**1.11**	**1.31**	**1.22**	**1.01**	**0.87**	**0.73**	**0.66**	**0.53**	**0.44**	**0.38**	**0.35**	**0.30**	**0.26**	**0.19**	**0.17**	**0.15**	**0.13**	**0.11**	**0.11**	**0.09**	**0.09**	**0.08**	**0.07**	**0.06**	**0.07**	**0.06**	**0.05**	**0.04**
2019	**0.03**	**0.46**	**1.28**	**1.52**	**1.35**	**1.11**	**0.95**	**0.88**	**0.75**	**0.61**	**0.55**	**0.47**	**0.39**	**0.34**	**0.25**	**0.21**	**0.20**	**0.16**	**0.14**	**0.14**	**0.12**	**0.11**	**0.10**	**0.08**	**0.08**	**0.09**	**0.07**	**0.07**	**0.06**	**0.05**

Conditional Prepayment Rates Fixed Rate 30 Year Streamline Refinance Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1992	2.74	27.00	31.54	7.86	13.29	10.75	21.02	26.24	12.03	16.61	28.43	37.84	24.50	17.31	15.24	8.62	7.29	5.49	6.87	6.25	**5.35**	**2.00**	**1.62**	**1.44**	**1.17**	**0.89**	**0.72**	**0.66**	**0.57**	**0.45**
1993	2.99	11.95	5.50	8.73	8.02	15.33	20.61	10.73	16.66	27.97	44.95	31.00	21.59	17.76	10.48	8.54	8.04	8.25	6.90	**6.37**	**2.56**	**2.01**	**1.80**	**1.51**	**1.17**	**0.93**	**0.87**	**0.78**	**0.65**	**0.50**
1994	1.89	4.12	6.98	7.08	11.46	15.75	9.54	14.17	22.50	41.14	29.97	21.60	16.04	11.05	8.90	8.26	7.80	7.36	**7.68**	**3.00**	**2.29**	**2.05**	**1.74**	**1.36**	**1.10**	**1.03**	**0.92**	**0.77**	**0.63**	**0.41**
1995	2.07	15.49	9.33	22.02	24.34	10.84	18.97	28.55	39.38	30.90	24.88	17.08	12.90	9.92	6.85	4.79	7.48	**5.44**	**3.06**	**2.42**	**2.14**	**1.83**	**1.48**	**1.14**	**1.02**	**0.89**	**0.75**	**0.64**	**0.52**	**0.41**
1996	2.13	6.08	17.81	22.63	10.22	18.18	29.93	45.95	35.95	27.39	19.58	13.22	9.58	7.87	7.95	5.93	**6.66**	**3.55**	**2.77**	**2.47**	**2.08**	**1.60**	**1.30**	**1.21**	**1.09**	**0.93**	**0.80**	**0.64**	**0.54**	**0.41**
1997	3.27	29.93	27.78	9.84	20.18	32.40	44.71	37.85	31.75	23.94	14.14	11.05	6.13	5.19	5.22	**7.20**	**4.04**	**3.16**	**2.82**	**2.32**	**1.82**	**1.50**	**1.43**	**1.30**	**1.11**	**0.96**	**0.75**	**0.63**	**0.51**	**0.40**
1998	4.44	18.01	8.12	17.94	32.35	53.38	42.37	33.17	22.49	15.91	10.75	9.03	6.74	6.29	**7.66**	**4.85**	**3.73**	**3.44**	**2.95**	**2.34**	**1.93**	**1.84**	**1.69**	**1.47**	**1.27**	**0.99**	**0.86**	**0.72**	**0.62**	**0.45**
1999	2.70	6.05	13.92	25.94	48.93	39.14	31.43	21.83	14.93	10.85	9.02	6.65	6.53	**8.52**	**5.25**	**3.95**	**3.66**	**3.20**	**2.61**	**2.15**	**2.05**	**1.92**	**1.70**	**1.48**	**1.16**	**1.03**	**0.88**	**0.76**	**0.60**	**0.44**
2000	3.60	33.27	36.35	44.70	40.69	32.62	24.72	15.56	9.46	7.39	5.76	4.43	**5.83**	**5.70**	**4.23**	**3.85**	**3.24**	**2.49**	**2.07**	**2.10**	**1.95**	**1.69**	**1.44**	**1.14**	**1.02**	**0.90**	**0.78**	**0.64**	**0.53**	**0.41**
2001	7.40	33.68	54.63	40.71	33.18	23.66	15.67	10.60	8.95	5.83	5.13	**6.29**	**4.63**	**3.67**	**3.61**	**3.38**	**2.84**	**2.38**	**2.33**	**2.22**	**2.00**	**1.77**	**1.41**	**1.27**	**1.11**	**0.98**	**0.83**	**0.72**	**0.63**	**0.48**
2002	10.78	51.13	37.18	30.24	21.00	14.95	9.93	9.84	6.99	6.07	**8.17**	**5.52**	**4.13**	**4.05**	**3.84**	**3.22**	**2.67**	**2.62**	**2.49**	**2.23**	**2.00**	**1.60**	**1.46**	**1.29**	**1.13**	**0.95**	**0.84**	**0.74**	**0.61**	**0.46**
2003	19.33	27.31	27.28	18.82	13.10	8.94	10.51	7.92	7.43	**9.73**	**6.11**	**4.36**	**4.36**	**4.26**	**3.65**	**3.06**	**3.04**	**2.96**	**2.70**	**2.43**	**1.93**	**1.80**	**1.60**	**1.41**	**1.18**	**1.04**	**0.94**	**0.80**	**0.66**	**0.50**
2004	11.42	21.98	16.14	11.80	7.59	7.42	6.15	5.98	**9.33**	**6.37**	**4.44**	**4.49**	**4.43**	**3.83**	**3.23**	**3.24**	**3.20**	**2.94**	**2.67**	**2.10**	**1.97**	**1.76**	**1.54**	**1.30**	**1.16**	**1.05**	**0.90**	**0.76**	**0.62**	**0.43**
2005	9.36	13.09	10.85	6.73	7.11	5.47	4.77	**9.95**	**8.61**	**6.09**	**6.23**	**6.17**	**5.36**	**4.55**	**4.65**	**4.65**	**4.27**	**3.87**	**3.08**	**2.90**	**2.63**	**2.34**	**1.99**	**1.83**	**1.66**	**1.42**	**1.26**	**1.12**	**0.95**	**0.64**
2006	3.95	10.96	7.93	10.17	6.27	4.66	**10.01**	**8.51**	**5.86**	**6.10**	**6.21**	**5.43**	**4.66**	**4.90**	**5.01**	**4.63**	**4.22**	**3.43**	**3.20**	**2.93**	**2.63**	**2.27**	**2.09**	**1.90**	**1.64**	**1.44**	**1.30**	**1.14**	**0.85**	**0.68**
2007	4.01	19.60	17.21	7.50	4.82	**8.03**	**5.71**	**3.86**	**4.55**	**5.22**	**4.84**	**4.15**	**4.39**	**4.51**	**4.25**	**3.98**	**3.22**	**3.01**	**2.83**	**2.59**	**2.23**	**2.04**	**1.85**	**1.62**	**1.45**	**1.35**	**1.17**	**0.91**	**0.82**	**0.69**
2008	4.24	26.27	8.72	5.29	**7.08**	**4.08**	**2.67**	**3.49**	**4.44**	**4.30**	**3.78**	**4.09**	**4.32**	**4.16**	**3.93**	**3.15**	**3.03**	**2.81**	**2.53**	**2.18**	**2.03**	**1.88**	**1.65**	**1.48**	**1.37**	**1.22**	**0.95**	**0.90**	**0.86**	**0.68**
2009	3.08	8.25	6.91	**8.96**	**3.09**	**2.11**	**3.02**	**4.13**	**4.16**	**3.75**	**4.06**	**4.44**	**4.34**	**4.15**	**3.30**	**3.24**	**3.04**	**2.72**	**2.36**	**2.20**	**2.06**	**1.83**	**1.65**	**1.51**	**1.36**	**1.05**	**1.02**	**1.03**	**0.93**	**0.67**
2010	2.81	5.70	**10.40**	**3.70**	**2.39**	**3.55**	**4.81**	**4.83**	**4.31**	**4.67**	**5.14**	**4.98**	**4.77**	**3.76**	**3.70**	**3.51**	**3.14**	**2.71**	**2.53**	**2.37**	**2.10**	**1.90**	**1.76**	**1.57**	**1.21**	**1.19**	**1.21**	**1.11**	**0.85**	**0.71**
2011	0.48	**8.90**	**5.29**	**2.62**	**4.19**	**5.97**	**5.86**	**5.13**	**5.56**	**6.23**	**5.87**	**5.73**	**4.34**	**4.28**	**4.16**	**3.70**	**3.19**	**2.98**	**2.78**	**2.46**	**2.23**	**2.13**	**1.89**	**1.41**	**1.41**	**1.44**	**1.34**	**1.05**	**0.95**	**0.66**
2012	**2.92**	**7.02**	**2.86**	**4.55**	**7.00**	**6.77**	**5.81**	**6.27**	**7.03**	**6.43**	**6.40**	**4.68**	**4.62**	**4.64**	**4.03**	**3.48**	**3.26**	**3.03**	**2.67**	**2.41**	**2.37**	**2.06**	**1.50**	**1.53**	**1.59**	**1.50**	**1.18**	**1.11**	**0.88**	**0.71**
2013	**5.86**	**8.92**	**12.02**	**12.36**	**10.39**	**9.72**	**10.61**	**10.67**	**9.23**	**9.34**	**6.71**	**6.38**	**6.36**	**5.53**	**4.64**	**4.31**	**3.80**	**3.47**	**3.15**	**3.36**	**2.98**	**2.21**	**2.15**	**2.23**	**2.01**	**1.60**	**1.53**	**1.26**	**1.11**	**0.79**
2014	**12.32**	**30.23**	**23.06**	**15.87**	**15.40**	**14.56**	**13.35**	**11.65**	**9.89**	**7.83**	**8.02**	**7.32**	**5.92**	**5.02**	**4.76**	**4.20**	**4.01**	**4.05**	**4.73**	**4.90**	**3.40**	**3.02**	**3.11**	**2.76**	**2.29**	**1.97**	**1.58**	**1.66**	**1.32**	**0.85**
2015	**18.29**	**37.08**	**24.05**	**21.96**	**20.64**	**17.76**	**16.43**	**14.72**	**11.37**	**10.43**	**8.93**	**7.44**	**6.86**	**6.92**	**6.83**	**5.12**	**5.27**	**6.51**	**5.92**	**3.85**	**3.76**	**3.76**	**2.90**	**2.13**	**2.53**	**1.90**	**1.76**	**1.38**	**1.09**	**0.69**
2016	**19.62**	**34.33**	**28.98**	**25.80**	**23.10**	**19.18**	**16.91**	**13.16**	**12.52**	**9.89**	**9.24**	**8.00**	**7.23**	**7.03**	**5.98**	**5.91**	**5.40**	**4.64**	**3.38**	**3.34**	**3.45**	**2.66**	**1.94**	**2.38**	**1.87**	**1.63**	**1.14**	**0.94**	**0.76**	**0.67**
2017	**20.20**	**35.35**	**29.34**	**22.03**	**17.11**	**15.11**	**12.79**	**11.02**	**8.84**	**8.66**	**6.94**	**6.15**	**6.16**	**7.19**	**6.01**	**5.46**	**3.44**	**2.99**	**3.27**	**3.45**	**3.01**	**2.28**	**1.96**	**1.98**	**1.61**	**0.97**	**0.83**	**0.86**	**0.79**	**0.54**
2018	**20.72**	**33.48**	**24.48**	**16.04**	**15.81**	**14.21**	**10.53**	**9.54**	**8.40**	**8.30**	**6.34**	**5.83**	**6.78**	**5.59**	**5.21**	**3.14**	**2.96**	**2.77**	**2.39**	**1.87**	**1.32**	**1.48**	**1.76**	**1.20**	**0.83**	**0.81**	**0.88**	**0.83**	**0.70**	**0.75**
2019	**19.80**	**29.55**	**23.23**	**20.87**	**14.92**	**12.52**	**12.89**	**11.54**	**10.16**	**7.59**	**6.89**	**6.52**	**5.80**	**5.31**	**3.36**	**2.69**	**2.83**	**2.80**	**2.41**	**1.55**	**1.59**	**1.71**	**1.20**	**1.02**	**1.28**	**1.55**	**1.57**	**1.21**	**1.19**	**0.84**

Cumulative Claim Rates Fixed Rate 30 Year Streamline Refinance Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1992	0.00	0.23	0.75	1.24	1.71	2.10	2.40	2.66	2.81	2.88	2.92	2.95	2.97	2.98	3.00	3.00	3.00	3.01	3.01	3.02	**3.03**	**3.05**	**3.06**	**3.07**	**3.08**	**3.09**	**3.10**	**3.10**	**3.11**	**3.11**
1993	0.01	0.20	0.80	1.67	2.78	3.71	4.33	4.70	4.88	4.99	5.05	5.09	5.10	5.11	5.12	5.12	5.13	5.14	5.15	**5.17**	**5.20**	**5.21**	**5.22**	**5.23**	**5.24**	**5.25**	**5.25**	**5.26**	**5.26**	**5.27**
1994	0.01	0.32	1.07	2.06	3.07	3.81	4.26	4.53	4.69	4.79	4.85	4.89	4.91	4.92	4.93	4.94	4.97	4.98	**5.01**	**5.06**	**5.09**	**5.11**	**5.13**	**5.14**	**5.15**	**5.16**	**5.16**	**5.17**	**5.18**	**5.18**
1995	0.02	0.43	1.59	3.06	4.09	4.83	5.26	5.49	5.67	5.78	5.83	5.88	5.91	5.91	5.93	5.95	5.99	**6.02**	**6.08**	**6.11**	**6.15**	**6.18**	**6.20**	**6.22**	**6.23**	**6.25**	**6.26**	**6.27**	**6.28**	**6.29**
1996	0.02	0.51	1.86	3.22	4.12	4.57	4.84	5.04	5.14	5.19	5.24	5.27	5.29	5.30	5.33	5.35	**5.39**	**5.46**	**5.50**	**5.53**	**5.55**	**5.57**	**5.58**	**5.59**	**5.60**	**5.61**	**5.62**	**5.62**	**5.63**	**5.64**
1997	0.02	0.64	1.81	2.82	3.43	3.78	4.01	4.12	4.18	4.22	4.24	4.26	4.29	4.31	4.33	**4.37**	**4.42**	**4.45**	**4.47**	**4.49**	**4.51**	**4.52**	**4.53**	**4.54**	**4.55**	**4.55**	**4.56**	**4.57**	**4.57**	**4.57**
1998	0.00	0.21	0.83	1.40	1.81	2.11	2.31	2.40	2.45	2.48	2.50	2.53	2.57	2.60	**2.64**	**2.73**	**2.76**	**2.79**	**2.81**	**2.83**	**2.84**	**2.85**	**2.86**	**2.87**	**2.87**	**2.88**	**2.88**	**2.88**	**2.89**	**2.89**
1999	0.01	0.26	0.71	1.21	1.67	1.94	2.10	2.19	2.24	2.29	2.34	2.39	2.43	**2.53**	**2.69**	**2.75**	**2.80**	**2.84**	**2.86**	**2.88**	**2.90**	**2.91**	**2.92**	**2.93**	**2.93**	**2.94**	**2.95**	**2.95**	**2.95**	**2.96**
2000	0.02	0.37	1.13	1.91	2.58	2.91	3.04	3.14	3.23	3.27	3.32	3.40	**3.50**	**3.67**	**3.76**	**3.82**	**3.88**	**3.91**	**3.94**	**3.96**	**3.98**	**4.00**	**4.01**	**4.02**	**4.04**	**4.04**	**4.05**	**4.06**	**4.07**	**4.07**
2001	0.00	0.19	0.97	1.69	2.14	2.41	2.58	2.72	2.84	3.00	3.13	**3.35**	**3.68**	**3.79**	**3.88**	**3.94**	**3.99**	**4.02**	**4.04**	**4.06**	**4.08**	**4.09**	**4.10**	**4.11**	**4.12**	**4.12**	**4.13**	**4.13**	**4.14**	**4.14**
2002	0.01	0.38	1.16	1.74	2.10	2.34	2.54	2.73	2.94	3.14	**3.47**	**3.96**	**4.14**	**4.28**	**4.39**	**4.45**	**4.50**	**4.54**	**4.57**	**4.60**	**4.62**	**4.63**	**4.65**	**4.66**	**4.67**	**4.68**	**4.68**	**4.69**	**4.70**	**4.70**
2003	0.01	0.47	1.20	1.72	2.12	2.50	2.89	3.36	3.75	**4.50**	**5.52**	**5.86**	**6.13**	**6.32**	**6.45**	**6.54**	**6.61**	**6.67**	**6.72**	**6.75**	**6.78**	**6.81**	**6.83**	**6.84**	**6.86**	**6.87**	**6.88**	**6.89**	**6.90**	**6.90**
2004	0.14	0.89	1.66	2.32	2.99	3.70	4.58	5.38	**6.79**	**8.68**	**9.31**	**9.78**	**10.13**	**10.35**	**10.52**	**10.64**	**10.74**	**10.82**	**10.88**	**10.93**	**10.98**	**11.01**	**11.04**	**11.06**	**11.08**	**11.10**	**11.11**	**11.13**	**11.14**	**11.14**
2005	0.11	0.71	1.94	3.33	4.87	6.68	8.29	**10.43**	**13.29**	**14.42**	**15.22**	**15.83**	**16.21**	**16.48**	**16.66**	**16.80**	**16.91**	**17.00**	**17.06**	**17.12**	**17.16**	**17.19**	**17.22**	**17.24**	**17.26**	**17.28**	**17.29**	**17.30**	**17.31**	**17.32**
2006	0.06	1.07	3.01	5.53	8.51	10.90	**14.19**	**18.25**	**19.96**	**21.18**	**22.12**	**22.68**	**23.06**	**23.32**	**23.51**	**23.66**	**23.78**	**23.86**	**23.93**	**23.99**	**24.03**	**24.07**	**24.10**	**24.12**	**24.14**	**24.16**	**24.17**	**24.18**	**24.19**	**24.20**
2007	0.05	1.12	4.30	8.19	11.20	**15.77**	**21.62**	**23.97**	**25.55**	**26.68**	**27.30**	**27.72**	**28.01**	**28.21**	**28.38**	**28.50**	**28.59**	**28.66**	**28.72**	**28.77**	**28.81**	**28.84**	**28.86**	**28.88**	**28.90**	**28.91**	**28.92**	**28.93**	**28.94**	**28.94**
2008	0.02	1.30	5.03	8.19	**13.37**	**20.20**	**23.15**	**24.92**	**26.18**	**26.87**	**27.32**	**27.64**	**27.86**	**28.04**	**28.17**	**28.27**	**28.35**	**28.41**	**28.46**	**28.50**	**28.53**	**28.56**	**28.58**	**28.60**	**28.61**	**28.62**	**28.63**	**28.64**	**28.65**	**28.65**
2009	0.02	0.84	2.99	**6.97**	**12.32**	**14.47**	**16.03**	**17.12**	**17.71**	**18.12**	**18.40**	**18.61**	**18.78**	**18.90**	**19.00**	**19.07**	**19.13**	**19.18**	**19.22**	**19.25**	**19.28**	**19.30**	**19.31**	**19.33**	**19.34**	**19.35**	**19.35**	**19.36**	**19.37**	**19.37**
2010	0.04	0.81	**3.06**	**6.59**	**8.19**	**9.61**	**10.66**	**11.24**	**11.65**	**11.94**	**12.15**	**12.32**	**12.45**	**12.54**	**12.62**	**12.68**	**12.73**	**12.77**	**12.80**	**12.83**	**12.85**	**12.87**	**12.88**	**12.89**	**12.90**	**12.91**	**12.92**	**12.92**	**12.93**	**12.93**
2011	0.05	**0.76**	**2.68**	**3.91**	**5.18**	**6.18**	**6.76**	**7.16**	**7.45**	**7.66**	**7.82**	**7.95**	**8.04**	**8.12**	**8.18**	**8.22**	**8.26**	**8.29**	**8.32**	**8.34**	**8.35**	**8.37**	**8.38**	**8.39**	**8.39**	**8.40**	**8.41**	**8.41**	**8.42**	**8.42**
2012	**0.04**	**0.60**	**1.48**	**2.74**	**3.91**	**4.65**	**5.17**	**5.53**	**5.80**	**6.00**	**6.16**	**6.28**	**6.37**	**6.45**	**6.50**	**6.55**	**6.59**	**6.62**	**6.65**	**6.67**	**6.68**	**6.70**	**6.71**	**6.72**	**6.73**	**6.74**	**6.74**	**6.75**	**6.75**	**6.76**
2013	**0.03**	**0.40**	**1.74**	**3.36**	**4.45**	**5.17**	**5.66**	**6.00**	**6.27**	**6.46**	**6.61**	**6.72**	**6.80**	**6.87**	**6.93**	**6.97**	**7.01**	**7.04**	**7.06**	**7.08**	**7.10**	**7.11**	**7.12**	**7.14**	**7.14**	**7.15**	**7.16**	**7.16**	**7.17**	**7.17**
2014	**0.02**	**0.52**	**1.78**	**2.83**	**3.53**	**3.98**	**4.28**	**4.51**	**4.67**	**4.80**	**4.89**	**4.97**	**5.03**	**5.07**	**5.11**	**5.14**	**5.16**	**5.18**	**5.20**	**5.22**	**5.23**	**5.24**	**5.25**	**5.26**	**5.27**	**5.27**	**5.28**	**5.28**	**5.28**	**5.29**
2015	**0.03**	**0.49**	**1.32**	**2.07**	**2.56**	**2.90**	**3.14**	**3.31**	**3.44**	**3.53**	**3.60**	**3.65**	**3.70**	**3.73**	**3.76**	**3.78**	**3.80**	**3.82**	**3.84**	**3.85**	**3.86**	**3.87**	**3.88**	**3.89**	**3.89**	**3.90**	**3.91**	**3.91**	**3.92**	**3.92**
2016	**0.02**	**0.38**	**1.12**	**1.74**	**2.16**	**2.44**	**2.64**	**2.77**	**2.86**	**2.94**	**2.99**	**3.03**	**3.06**	**3.09**	**3.11**	**3.13**	**3.15**	**3.16**	**3.17**	**3.18**	**3.19**	**3.19**	**3.20**	**3.20**	**3.21**	**3.21**	**3.22**	**3.22**	**3.22**	**3.23**
2017	**0.02**	**0.39**	**1.04**	**1.54**	**1.89**	**2.13**	**2.30**	**2.42**	**2.51**	**2.58**	**2.63**	**2.67**	**2.70**	**2.73**	**2.75**	**2.77**	**2.78**	**2.79**	**2.80**	**2.81**	**2.81**	**2.82**	**2.83**	**2.83**	**2.83**	**2.84**	**2.84**	**2.84**	**2.85**	**2.85**
2018	**0.03**	**0.38**	**0.96**	**1.46**	**1.86**	**2.12**	**2.31**	**2.46**	**2.57**	**2.66**	**2.72**	**2.77**	**2.82**	**2.85**	**2.88**	**2.90**	**2.92**	**2.93**	**2.94**	**2.95**	**2.96**	**2.97**	**2.97**	**2.98**	**2.99**	**2.99**	**3.00**	**3.00**	**3.00**	**3.01**
2019	**0.03**	**0.40**	**1.12**	**1.76**	**2.20**	**2.50**	**2.72**	**2.90**	**3.03**	**3.13**	**3.21**	**3.27**	**3.32**	**3.35**	**3.38**	**3.40**	**3.42**	**3.44**	**3.45**	**3.46**	**3.47**	**3.48**	**3.49**	**3.49**	**3.50**	**3.51**	**3.51**	**3.52**	**3.52**	**3.52**

Cumulative Prepayment Rates Fixed Rate 30 Year Streamline Refinance Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1992	2.75	29.12	51.43	55.21	61.02	65.05	71.99	78.73	80.98	83.69	87.52	91.16	92.61	93.38	93.94	94.21	94.42	94.56	94.74	94.90	**95.08**	**95.12**	**95.15**	**95.17**	**95.19**	**95.21**	**95.22**	**95.23**	**95.24**	**95.25**
1993	3.00	14.63	19.33	26.34	32.14	42.18	53.37	57.94	64.20	72.89	82.87	86.62	88.41	89.56	90.12	90.53	90.89	91.23	91.49	**91.72**	**91.81**	**91.86**	**91.92**	**91.96**	**91.99**	**92.02**	**92.04**	**92.06**	**92.07**	**92.09**
1994	1.90	5.96	12.54	18.69	27.82	38.75	44.27	51.60	61.53	75.50	81.42	84.39	86.11	87.10	87.82	88.43	88.96	89.44	**89.89**	**90.06**	**90.17**	**90.26**	**90.34**	**90.40**	**90.45**	**90.50**	**90.53**	**90.57**	**90.59**	**90.61**
1995	2.08	17.28	24.98	41.21	54.81	59.28	66.13	74.33	82.30	86.02	88.08	89.11	89.76	90.18	90.46	90.63	90.91	**91.09**	**91.19**	**91.26**	**91.32**	**91.36**	**91.39**	**91.42**	**91.44**	**91.46**	**91.47**	**91.49**	**91.50**	**91.51**
1996	2.14	8.11	24.45	41.17	46.88	55.84	67.74	80.41	85.66	88.19	89.49	90.20	90.63	90.96	91.26	91.47	**91.69**	**91.80**	**91.88**	**91.95**	**92.00**	**92.04**	**92.07**	**92.10**	**92.13**	**92.15**	**92.16**	**92.18**	**92.19**	**92.20**
1997	3.28	32.31	50.98	55.64	64.06	74.62	84.32	88.75	91.01	92.16	92.68	93.02	93.19	93.32	93.44	**93.61**	**93.70**	**93.76**	**93.82**	**93.86**	**93.89**	**93.91**	**93.93**	**93.95**	**93.97**	**93.98**	**93.99**	**94.00**	**94.00**	**94.01**
1998	4.46	21.71	28.08	40.90	59.64	80.32	87.79	91.09	92.56	93.35	93.81	94.14	94.37	94.57	**94.79**	**94.92**	**95.01**	**95.09**	**95.15**	**95.21**	**95.24**	**95.28**	**95.31**	**95.34**	**95.36**	**95.38**	**95.39**	**95.40**	**95.41**	**95.42**
1999	2.71	8.63	21.38	41.67	69.76	80.98	86.37	88.90	90.24	91.06	91.67	92.07	92.44	**92.88**	**93.13**	**93.30**	**93.45**	**93.58**	**93.68**	**93.76**	**93.83**	**93.89**	**93.94**	**93.99**	**94.03**	**94.06**	**94.08**	**94.10**	**94.12**	**94.14**
2000	3.61	35.75	59.02	76.89	85.55	89.43	91.33	92.21	92.65	92.96	93.18	93.33	**93.53**	**93.70**	**93.82**	**93.92**	**93.99**	**94.05**	**94.09**	**94.14**	**94.17**	**94.20**	**94.23**	**94.25**	**94.26**	**94.28**	**94.29**	**94.30**	**94.31**	**94.31**
2001	7.42	38.72	72.21	83.17	88.21	90.50	91.62	92.24	92.69	92.95	93.16	**93.40**	**93.55**	**93.66**	**93.75**	**93.83**	**93.90**	**93.95**	**94.00**	**94.05**	**94.09**	**94.12**	**94.14**	**94.17**	**94.19**	**94.20**	**94.22**	**94.23**	**94.24**	**94.25**
2002	10.83	56.60	72.65	80.61	84.33	86.37	87.50	88.49	89.10	89.59	**90.19**	**90.55**	**90.78**	**90.99**	**91.18**	**91.33**	**91.44**	**91.55**	**91.66**	**91.74**	**91.82**	**91.88**	**91.93**	**91.97**	**92.01**	**92.04**	**92.07**	**92.09**	**92.12**	**92.13**
2003	19.43	41.54	57.44	65.26	69.61	72.15	74.83	76.61	78.11	**79.90**	**80.87**	**81.48**	**82.04**	**82.56**	**82.98**	**83.31**	**83.63**	**83.93**	**84.20**	**84.43**	**84.60**	**84.75**	**84.89**	**85.01**	**85.10**	**85.19**	**85.26**	**85.33**	**85.38**	**85.43**
2004	11.60	31.10	42.13	48.80	52.54	55.87	58.38	60.61	**63.82**	**65.73**	**66.89**	**67.98**	**68.99**	**69.81**	**70.47**	**71.10**	**71.71**	**72.25**	**72.72**	**73.08**	**73.40**	**73.67**	**73.91**	**74.11**	**74.28**	**74.43**	**74.56**	**74.67**	**74.76**	**74.84**
2005	9.47	21.38	29.88	34.50	38.95	42.04	44.51	**49.28**	**52.82**	**54.93**	**56.88**	**58.64**	**60.04**	**61.15**	**62.23**	**63.24**	**64.12**	**64.89**	**65.47**	**66.01**	**66.45**	**66.83**	**67.15**	**67.43**	**67.69**	**67.89**	**68.07**	**68.22**	**68.36**	**68.46**
2006	3.97	14.52	21.24	28.98	33.10	35.84	**41.25**	**45.11**	**47.30**	**49.34**	**51.21**	**52.69**	**53.87**	**55.03**	**56.14**	**57.11**	**57.95**	**58.60**	**59.19**	**59.71**	**60.14**	**60.50**	**60.83**	**61.11**	**61.36**	**61.56**	**61.74**	**61.90**	**62.02**	**62.14**
2007	4.03	22.88	36.02	40.51	43.00	**46.71**	**48.87**	**50.03**	**51.23**	**52.46**	**53.48**	**54.29**	**55.09**	**55.87**	**56.56**	**57.17**	**57.65**	**58.07**	**58.46**	**58.81**	**59.09**	**59.34**	**59.57**	**59.76**	**59.93**	**60.09**	**60.22**	**60.33**	**60.43**	**60.53**
2008	4.25	29.50	35.55	38.71	**42.49**	**44.31**	**45.27**	**46.39**	**47.67**	**48.81**	**49.74**	**50.69**	**51.65**	**52.51**	**53.29**	**53.89**	**54.44**	**54.94**	**55.37**	**55.74**	**56.06**	**56.36**	**56.62**	**56.85**	**57.06**	**57.24**	**57.38**	**57.52**	**57.66**	**57.78**
2009	3.09	11.13	17.23	**24.41**	**26.54**	**27.85**	**29.60**	**31.87**	**34.01**	**35.84**	**37.74**	**39.71**	**41.54**	**43.21**	**44.48**	**45.69**	**46.78**	**47.73**	**48.53**	**49.26**	**49.93**	**50.51**	**51.02**	**51.49**	**51.91**	**52.23**	**52.54**	**52.86**	**53.15**	**53.39**
2010	2.84	8.40	**17.89**	**20.84**	**22.58**	**25.06**	**28.23**	**31.21**	**33.71**	**36.29**	**38.99**	**41.45**	**43.68**	**45.36**	**46.94**	**48.38**	**49.63**	**50.67**	**51.62**	**52.48**	**53.23**	**53.89**	**54.50**	**55.03**	**55.44**	**55.84**	**56.24**	**56.61**	**56.91**	**57.21**
2011	0.49	**9.38**	**14.15**	**16.35**	**19.72**	**24.24**	**28.35**	**31.71**	**35.15**	**38.76**	**41.95**	**44.86**	**46.93**	**48.89**	**50.70**	**52.25**	**53.54**	**54.70**	**55.76**	**56.67**	**57.47**	**58.22**	**58.88**	**59.36**	**59.84**	**60.33**	**60.79**	**61.15**	**61.50**	**61.79**
2012	**2.94**	**9.78**	**12.36**	**16.30**	**22.01**	**27.06**	**31.06**	**35.09**	**39.31**	**42.88**	**46.18**	**48.44**	**50.56**	**52.58**	**54.26**	**55.65**	**56.90**	**58.03**	**59.00**	**59.85**	**60.66**	**61.36**	**61.86**	**62.36**	**62.87**	**63.36**	**63.73**	**64.10**	**64.40**	**64.68**
2013	**5.89**	**14.30**	**24.57**	**33.71**	**40.26**	**45.65**	**50.88**	**55.54**	**59.12**	**62.37**	**64.48**	**66.34**	**68.06**	**69.46**	**70.56**	**71.53**	**72.35**	**73.07**	**73.70**	**74.36**	**74.93**	**75.34**	**75.73**	**76.13**	**76.48**	**76.76**	**77.02**	**77.24**	**77.44**	**77.61**
2014	**12.37**	**38.95**	**52.94**	**60.14**	**65.87**	**70.34**	**73.78**	**76.35**	**78.25**	**79.60**	**80.87**	**81.92**	**82.71**	**83.33**	**83.89**	**84.35**	**84.78**	**85.20**	**85.66**	**86.12**	**86.42**	**86.68**	**86.94**	**87.15**	**87.33**	**87.49**	**87.61**	**87.74**	**87.85**	**87.93**
2015	**18.37**	**48.74**	**60.99**	**69.32**	**75.24**	**79.20**	**82.15**	**84.33**	**85.74**	**86.87**	**87.72**	**88.36**	**88.90**	**89.41**	**89.88**	**90.20**	**90.52**	**90.90**	**91.23**	**91.43**	**91.62**	**91.80**	**91.93**	**92.03**	**92.14**	**92.22**	**92.30**	**92.36**	**92.41**	**92.45**
2016	**19.74**	**47.39**	**62.60**	**72.00**	**78.08**	**81.88**	**84.54**	**86.22**	**87.61**	**88.54**	**89.33**	**89.94**	**90.45**	**90.90**	**91.26**	**91.58**	**91.86**	**92.08**	**92.24**	**92.39**	**92.54**	**92.65**	**92.73**	**92.83**	**92.90**	**92.97**	**93.01**	**93.05**	**93.08**	**93.12**
2017	**20.31**	**48.60**	**63.62**	**71.44**	**76.08**	**79.41**	**81.78**	**83.53**	**84.77**	**85.87**	**86.67**	**87.32**	**87.93**	**88.60**	**89.11**	**89.53**	**89.78**	**89.99**	**90.22**	**90.44**	**90.63**	**90.76**	**90.88**	**91.00**	**91.09**	**91.15**	**91.20**	**91.25**	**91.30**	**91.35**
2018	**20.83**	**47.42**	**60.24**	**66.48**	**71.55**	**75.31**	**77.68**	**79.58**	**81.08**	**82.43**	**83.36**	**84.16**	**85.04**	**85.70**	**86.26**	**86.58**	**86.88**	**87.14**	**87.36**	**87.53**	**87.65**	**87.78**	**87.94**	**88.04**	**88.10**	**88.17**	**88.25**	**88.33**	**88.40**	**88.48**
2019	**19.92**	**43.67**	**56.70**	**65.54**	**70.41**	**73.83**	**76.89**	**79.23**	**81.04**	**82.24**	**83.24**	**84.10**	**84.82**	**85.42**	**85.79**	**86.06**	**86.36**	**86.64**	**86.88**	**87.03**	**87.18**	**87.33**	**87.44**	**87.53**	**87.65**	**87.80**	**87.95**	**88.06**	**88.18**	**88.29**

Conditional Claim Rates Fixed Rate 15 Year Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1998	0.00	0.06	0.26	0.26	0.39	0.37	0.35	0.34	0.32	0.16	0.10	0.16	0.20	0.04	**0.10**
1999	0.00	0.07	0.22	0.33	0.48	0.43	0.40	0.16	0.20	0.19	0.16	0.06	0.09	**0.16**	**0.31**
2000	0.00	0.11	0.57	1.22	1.75	0.92	0.87	0.41	0.37	0.49	0.57	0.51	**0.16**	**1.06**	**0.62**
2001	0.00	0.12	0.54	0.97	0.91	0.92	0.71	0.47	0.79	0.32	0.68	**0.33**	**0.70**	**0.33**	**0.21**
2002	0.02	0.14	0.49	0.62	0.60	0.35	0.31	0.21	0.39	0.36	**0.39**	**0.85**	**0.44**	**0.24**	**0.21**
2003	0.01	0.16	0.32	0.32	0.20	0.22	0.42	0.38	0.42	**0.58**	**0.97**	**0.47**	**0.25**	**0.23**	**0.14**
2004	0.04	0.17	0.26	0.36	0.42	0.45	0.51	0.50	**0.66**	**1.27**	**0.61**	**0.30**	**0.29**	**0.20**	**0.12**
2005	0.02	0.62	1.67	1.47	1.61	1.59	1.33	**1.25**	**2.73**	**1.42**	**0.91**	**0.95**	**0.67**	**0.47**	**0.32**
2006	0.05	1.29	2.18	2.70	2.69	1.97	**3.09**	**4.83**	**2.47**	**1.89**	**1.94**	**1.37**	**0.97**	**0.65**	**0.41**
2007	0.01	0.82	2.24	2.56	2.08	**4.66**	**7.07**	**3.25**	**2.58**	**2.60**	**1.85**	**1.32**	**0.94**	**0.62**	**0.44**
2008	0.01	0.35	1.26	1.48	**2.94**	**4.77**	**2.36**	**1.73**	**1.72**	**1.21**	**0.88**	**0.63**	**0.43**	**0.33**	**0.22**
2009	0.01	0.17	0.26	**0.83**	**1.42**	**0.61**	**0.53**	**0.52**	**0.36**	**0.27**	**0.20**	**0.14**	**0.11**	**0.08**	**0.05**
2010	0.00	0.04	**0.19**	**0.40**	**0.19**	**0.20**	**0.20**	**0.14**	**0.11**	**0.09**	**0.07**	**0.06**	**0.04**	**0.03**	**0.02**
2011	0.00	**0.03**	**0.19**	**0.14**	**0.16**	**0.16**	**0.12**	**0.09**	**0.07**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**
2012	**0.01**	**0.04**	**0.11**	**0.19**	**0.20**	**0.14**	**0.12**	**0.09**	**0.07**	**0.06**	**0.05**	**0.04**	**0.03**	**0.03**	**0.02**
2013	**0.00**	**0.04**	**0.26**	**0.40**	**0.30**	**0.24**	**0.19**	**0.14**	**0.12**	**0.10**	**0.08**	**0.06**	**0.05**	**0.04**	**0.03**
2014	**0.00**	**0.09**	**0.48**	**0.54**	**0.46**	**0.37**	**0.30**	**0.26**	**0.21**	**0.17**	**0.14**	**0.11**	**0.09**	**0.07**	**0.05**
2015	**0.00**	**0.11**	**0.40**	**0.53**	**0.45**	**0.37**	**0.33**	**0.28**	**0.23**	**0.19**	**0.15**	**0.13**	**0.10**	**0.08**	**0.05**
2016	**0.00**	**0.09**	**0.41**	**0.48**	**0.41**	**0.36**	**0.30**	**0.24**	**0.20**	**0.17**	**0.14**	**0.12**	**0.09**	**0.07**	**0.05**
2017	**0.00**	**0.11**	**0.40**	**0.44**	**0.38**	**0.32**	**0.27**	**0.23**	**0.19**	**0.16**	**0.13**	**0.10**	**0.08**	**0.07**	**0.05**
2018	**0.00**	**0.11**	**0.37**	**0.44**	**0.39**	**0.31**	**0.26**	**0.22**	**0.19**	**0.16**	**0.13**	**0.10**	**0.09**	**0.07**	**0.05**
2019	**0.00**	**0.11**	**0.41**	**0.48**	**0.39**	**0.33**	**0.28**	**0.24**	**0.21**	**0.17**	**0.14**	**0.12**	**0.09**	**0.07**	**0.05**

Conditional Prepayment Rates Fixed Rate 15 Year Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1998	1.05	6.04	6.78	11.68	18.90	30.75	21.73	17.77	14.81	12.29	9.81	10.46	9.16	12.88	**19.18**
1999	0.87	3.50	9.77	17.23	29.97	22.06	17.75	13.90	10.87	9.04	7.91	7.15	9.81	**16.34**	**14.99**
2000	0.78	18.19	29.02	36.85	25.55	21.06	16.22	10.73	8.29	7.70	6.83	6.62	**13.79**	**17.48**	**16.15**
2001	2.23	14.52	38.66	29.37	23.60	15.27	12.65	11.28	7.22	8.60	7.38	**14.15**	**16.33**	**16.02**	**14.18**
2002	2.25	26.89	26.56	20.87	16.67	12.69	10.29	8.07	7.44	7.02	**12.42**	**14.54**	**13.98**	**13.26**	**11.60**
2003	4.65	15.83	19.07	15.69	12.73	10.29	8.91	8.68	7.94	**12.47**	**11.80**	**10.91**	**10.81**	**10.47**	**8.60**
2004	4.87	14.67	13.64	11.63	8.73	8.05	7.42	6.79	**11.20**	**10.62**	**9.69**	**9.70**	**9.77**	**8.76**	**6.76**
2005	5.29	11.32	10.84	9.79	8.17	7.17	7.60	**10.64**	**9.94**	**9.25**	**9.56**	**9.81**	**9.22**	**8.58**	**8.22**
2006	3.70	10.62	11.66	12.42	9.19	7.54	**10.86**	**9.55**	**9.00**	**9.37**	**9.88**	**9.60**	**9.29**	**10.26**	**9.34**
2007	3.57	12.45	16.57	9.97	7.84	**10.07**	**8.96**	**8.33**	**9.11**	**9.84**	**9.53**	**9.26**	**10.40**	**10.32**	**9.32**
2008	1.51	17.59	13.38	11.62	**14.92**	**9.02**	**7.50**	**8.39**	**9.12**	**8.83**	**8.58**	**9.69**	**9.85**	**9.67**	**9.42**
2009	4.41	7.61	12.71	**17.99**	**9.51**	**6.60**	**7.12**	**7.93**	**7.68**	**7.34**	**8.26**	**8.54**	**8.55**	**8.82**	**7.38**
2010	0.91	7.92	**17.49**	**10.81**	**7.14**	**6.68**	**7.33**	**7.08**	**6.73**	**7.57**	**7.83**	**7.91**	**8.33**	**7.39**	**6.67**
2011	0.94	**17.96**	**12.79**	**8.10**	**7.53**	**7.52**	**7.01**	**6.45**	**7.29**	**7.70**	**7.80**	**8.29**	**7.39**	**7.29**	**6.67**
2012	**1.35**	**7.86**	**6.54**	**7.81**	**7.84**	**6.53**	**5.77**	**6.59**	**7.03**	**7.20**	**7.75**	**6.90**	**7.12**	**7.21**	**6.56**
2013	**2.53**	**10.54**	**14.94**	**13.67**	**10.32**	**8.28**	**9.27**	**9.52**	**9.36**	**10.13**	**9.15**	**9.42**	**9.55**	**9.36**	**8.05**
2014	**3.93**	**22.66**	**21.92**	**17.05**	**13.67**	**13.03**	**12.29**	**12.01**	**12.78**	**11.67**	**12.07**	**12.41**	**12.66**	**12.45**	**11.46**
2015	**4.22**	**21.85**	**19.61**	**16.93**	**15.77**	**13.35**	**12.75**	**13.66**	**12.08**	**12.53**	**12.56**	**12.94**	**13.00**	**12.53**	**11.49**
2016	**4.01**	**16.91**	**19.06**	**18.91**	**15.28**	**12.34**	**12.40**	**11.53**	**11.90**	**11.46**	**11.96**	**12.07**	**11.76**	**11.43**	**10.69**
2017	**3.68**	**18.24**	**20.93**	**16.82**	**12.97**	**11.66**	**11.44**	**10.99**	**10.96**	**11.05**	**11.29**	**11.13**	**11.14**	**11.45**	**10.32**
2018	**3.35**	**19.25**	**18.25**	**15.37**	**13.88**	**11.37**	**10.67**	**11.33**	**10.87**	**11.10**	**10.85**	**10.88**	**11.34**	**10.96**	**9.49**
2019	**4.20**	**17.71**	**18.47**	**17.35**	**12.77**	**11.09**	**12.03**	**11.08**	**11.25**	**11.46**	**11.35**	**11.69**	**11.71**	**10.78**	**8.59**

Cumulative Claim Rates Fixed Rate 15 Year Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1998	0.00	0.06	0.31	0.54	0.84	1.07	1.21	1.32	1.41	1.44	1.46	1.49	1.52	1.53	**1.54**
1999	0.00	0.08	0.29	0.58	0.92	1.13	1.28	1.33	1.38	1.42	1.46	1.47	1.48	**1.51**	**1.56**
2000	0.00	0.11	0.58	1.28	1.89	2.13	2.29	2.36	2.41	2.48	2.55	2.60	**2.62**	**2.72**	**2.77**
2001	0.00	0.12	0.58	1.08	1.40	1.64	1.80	1.89	2.02	2.07	2.17	**2.21**	**2.29**	**2.33**	**2.35**
2002	0.02	0.16	0.51	0.83	1.07	1.19	1.28	1.33	1.43	1.51	**1.59**	**1.74**	**1.81**	**1.84**	**1.87**
2003	0.01	0.16	0.42	0.63	0.74	0.84	1.02	1.17	1.32	**1.50**	**1.78**	**1.89**	**1.95**	**2.00**	**2.02**
2004	0.04	0.21	0.42	0.67	0.93	1.18	1.44	1.68	**1.97**	**2.46**	**2.67**	**2.76**	**2.84**	**2.89**	**2.92**
2005	0.02	0.62	2.02	3.10	4.14	5.08	5.78	**6.40**	**7.57**	**8.10**	**8.40**	**8.68**	**8.85**	**8.97**	**9.05**
2006	0.05	1.33	3.22	5.23	6.92	8.01	**9.56**	**11.63**	**12.55**	**13.16**	**13.72**	**14.06**	**14.28**	**14.42**	**14.51**
2007	0.01	0.83	2.74	4.51	5.76	**8.28**	**11.52**	**12.76**	**13.64**	**14.41**	**14.89**	**15.20**	**15.40**	**15.52**	**15.60**
2008	0.01	0.36	1.40	2.43	**4.21**	**6.57**	**7.58**	**8.24**	**8.83**	**9.20**	**9.44**	**9.60**	**9.70**	**9.77**	**9.82**
2009	0.01	0.18	0.42	**1.07**	**1.97**	**2.31**	**2.59**	**2.84**	**3.00**	**3.11**	**3.18**	**3.23**	**3.27**	**3.29**	**3.31**
2010	0.00	0.04	**0.22**	**0.52**	**0.66**	**0.78**	**0.89**	**0.97**	**1.03**	**1.07**	**1.09**	**1.12**	**1.13**	**1.14**	**1.15**
2011	0.00	**0.04**	**0.19**	**0.29**	**0.40**	**0.50**	**0.56**	**0.61**	**0.64**	**0.67**	**0.69**	**0.70**	**0.72**	**0.72**	**0.73**
2012	**0.01**	**0.05**	**0.16**	**0.32**	**0.47**	**0.57**	**0.65**	**0.71**	**0.75**	**0.79**	**0.81**	**0.83**	**0.84**	**0.86**	**0.86**
2013	**0.00**	**0.04**	**0.27**	**0.57**	**0.76**	**0.90**	**0.99**	**1.06**	**1.11**	**1.15**	**1.18**	**1.20**	**1.21**	**1.22**	**1.23**
2014	**0.00**	**0.09**	**0.45**	**0.77**	**0.99**	**1.14**	**1.24**	**1.32**	**1.38**	**1.42**	**1.45**	**1.47**	**1.48**	**1.49**	**1.50**
2015	**0.00**	**0.11**	**0.41**	**0.73**	**0.95**	**1.11**	**1.22**	**1.31**	**1.37**	**1.42**	**1.45**	**1.47**	**1.49**	**1.50**	**1.50**
2016	**0.00**	**0.10**	**0.43**	**0.74**	**0.95**	**1.10**	**1.21**	**1.29**	**1.35**	**1.39**	**1.43**	**1.45**	**1.46**	**1.47**	**1.48**
2017	**0.00**	**0.11**	**0.43**	**0.70**	**0.90**	**1.04**	**1.15**	**1.22**	**1.28**	**1.32**	**1.35**	**1.38**	**1.39**	**1.40**	**1.41**
2018	**0.00**	**0.11**	**0.40**	**0.68**	**0.89**	**1.03**	**1.14**	**1.22**	**1.28**	**1.32**	**1.35**	**1.37**	**1.39**	**1.40**	**1.41**
2019	**0.00**	**0.11**	**0.43**	**0.74**	**0.95**	**1.10**	**1.21**	**1.30**	**1.36**	**1.41**	**1.44**	**1.46**	**1.48**	**1.49**	**1.50**

Cumulative Prepayment Rates Fixed Rate 15 Year Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1998	1.07	7.16	13.57	23.87	38.47	57.62	66.83	72.69	76.69	79.58	81.74	83.64	85.17	87.19	**90.06**
1999	0.88	4.43	13.95	28.96	50.54	61.49	68.29	72.64	75.61	77.90	79.86	81.33	83.23	**86.21**	**88.72**
2000	0.79	19.13	42.87	64.07	73.08	78.46	81.68	83.45	84.69	85.84	86.79	87.56	**89.10**	**90.81**	**92.19**
2001	2.27	16.76	49.48	64.39	72.70	76.75	79.56	81.74	82.99	84.38	85.49	**87.39**	**89.28**	**90.83**	**92.10**
2002	2.30	29.13	48.22	59.12	65.94	70.23	73.26	75.38	77.19	78.81	**81.51**	**84.18**	**86.35**	**88.18**	**89.72**
2003	4.76	20.15	35.66	45.88	52.85	57.75	61.59	64.95	67.78	**71.85**	**75.20**	**77.90**	**80.33**	**82.50**	**84.33**
2004	5.00	19.23	30.43	38.64	44.07	48.65	52.51	55.76	**60.76**	**64.96**	**68.30**	**71.35**	**74.16**	**76.54**	**78.44**
2005	5.46	16.36	25.54	32.80	38.19	42.45	46.58	**51.86**	**56.21**	**59.75**	**63.02**	**66.03**	**68.61**	**70.89**	**73.10**
2006	3.76	14.14	24.14	33.33	39.08	43.26	**48.71**	**52.84**	**56.18**	**59.28**	**62.14**	**64.60**	**66.76**	**68.98**	**71.00**
2007	3.62	15.79	29.86	36.68	41.39	**46.86**	**51.01**	**54.24**	**57.38**	**60.39**	**62.93**	**65.12**	**67.37**	**69.42**	**71.26**
2008	1.53	19.17	30.08	38.19	**47.24**	**51.73**	**54.95**	**58.20**	**61.39**	**64.15**	**66.56**	**69.05**	**71.34**	**73.44**	**75.46**
2009	4.50	11.95	23.32	**37.28**	**43.28**	**46.99**	**50.72**	**54.57**	**57.98**	**61.00**	**64.15**	**67.14**	**69.92**	**72.64**	**74.95**
2010	0.94	8.97	**25.18**	**33.42**	**38.24**	**42.44**	**46.74**	**50.59**	**54.00**	**57.60**	**61.04**	**64.26**	**67.43**	**70.13**	**72.71**
2011	0.96	**19.06**	**29.59**	**35.38**	**40.34**	**44.92**	**48.86**	**52.25**	**55.85**	**59.38**	**62.68**	**65.92**	**68.63**	**71.22**	**73.71**
2012	**1.38**	**9.30**	**15.34**	**22.07**	**28.29**	**33.05**	**36.99**	**41.25**	**45.50**	**49.55**	**53.61**	**56.97**	**60.27**	**63.48**	**66.49**
2013	**2.57**	**12.99**	**26.13**	**36.32**	**42.91**	**47.65**	**52.51**	**57.05**	**61.09**	**65.06**	**68.28**	**71.33**	**74.17**	**76.77**	**79.05**
2014	**3.99**	**26.10**	**42.49**	**52.35**	**58.87**	**64.19**	**68.55**	**72.28**	**75.77**	**78.55**	**81.10**	**83.41**	**85.48**	**87.33**	**88.99**
2015	**4.29**	**25.56**	**40.34**	**50.54**	**58.36**	**63.92**	**68.49**	**72.75**	**75.99**	**78.94**	**81.52**	**83.84**	**85.90**	**87.68**	**89.26**
2016	**4.08**	**20.60**	**35.96**	**48.20**	**56.14**	**61.53**	**66.27**	**70.12**	**73.63**	**76.59**	**79.32**	**81.76**	**83.88**	**85.76**	**87.52**
2017	**3.74**	**21.63**	**38.26**	**48.74**	**55.40**	**60.58**	**65.07**	**68.87**	**72.22**	**75.23**	**77.97**	**80.37**	**82.54**	**84.60**	**86.43**
2018	**3.42**	**22.35**	**36.71**	**46.50**	**53.92**	**59.13**	**63.45**	**67.54**	**70.98**	**74.14**	**76.86**	**79.31**	**81.62**	**83.65**	**85.37**
2019	**4.28**	**21.54**	**36.23**	**47.38**	**54.08**	**59.15**	**64.02**	**67.92**	**71.46**	**74.64**	**77.42**	**79.97**	**82.25**	**84.15**	**85.67**

Conditional Claim Rates Fixed Rate 15 Year Streamline Refinance Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1992	0.00	0.06	0.11	0.20	0.21	0.16	0.24	0.15	0.10	0.12	0.02	0.01	0.00	0.00	0.00
1993	0.00	0.04	0.10	0.15	0.18	0.14	0.12	0.13	0.08	0.06	0.03	0.02	0.01	0.02	0.02
1994	0.00	0.06	0.20	0.25	0.27	0.22	0.18	0.09	0.09	0.06	0.04	0.05	0.02	0.02	0.02
1995	0.01	0.14	0.44	0.61	0.48	0.39	0.45	0.28	0.20	0.20	0.00	0.21	0.00	0.00	0.02
1996	0.00	0.05	0.15	0.32	0.34	0.32	0.23	0.12	0.23	0.07	0.06	0.03	0.00	0.01	0.00
1997	0.00	0.15	0.20	0.38	0.33	0.19	0.15	0.14	0.23	0.05	0.03	0.00	0.08	0.00	0.00
1998	0.00	0.02	0.14	0.14	0.22	0.11	0.15	0.14	0.03	0.04	0.05	0.07	0.15	0.03	**0.07**
1999	0.00	0.03	0.08	0.08	0.16	0.13	0.12	0.09	0.07	0.02	0.08	0.14	0.04	**0.15**	**0.19**
2000	0.00	0.08	0.13	0.29	0.28	0.20	0.20	0.32	0.30	0.43	0.36	0.00	**0.17**	**0.20**	**0.07**
2001	0.00	0.04	0.10	0.22	0.59	0.33	0.19	0.12	0.30	0.45	0.32	**0.34**	**0.27**	**0.11**	**0.05**
2002	0.00	0.04	0.22	0.17	0.19	0.13	0.14	0.15	0.11	0.25	**0.22**	**0.38**	**0.20**	**0.07**	**0.05**
2003	0.00	0.05	0.12	0.16	0.09	0.15	0.14	0.29	0.22	**0.31**	**0.46**	**0.24**	**0.07**	**0.06**	**0.03**
2004	0.02	0.08	0.17	0.14	0.15	0.23	0.34	0.32	**0.39**	**0.48**	**0.24**	**0.09**	**0.07**	**0.04**	**0.02**
2005	0.01	0.10	0.12	0.20	0.40	0.47	0.38	**0.60**	**0.66**	**0.33**	**0.14**	**0.12**	**0.07**	**0.04**	**0.03**
2006	0.00	0.05	0.09	0.47	0.61	0.34	**0.92**	**0.69**	**0.48**	**0.23**	**0.21**	**0.12**	**0.06**	**0.04**	**0.02**
2007	0.00	0.13	0.27	0.97	0.36	**0.90**	**2.55**	**1.49**	**0.58**	**0.47**	**0.28**	**0.15**	**0.11**	**0.06**	**0.04**
2008	0.00	0.09	0.59	0.86	**2.08**	**3.18**	**1.36**	**0.77**	**0.64**	**0.35**	**0.19**	**0.13**	**0.07**	**0.05**	**0.03**
2009	0.00	0.11	0.42	**1.35**	**2.03**	**0.69**	**0.48**	**0.39**	**0.22**	**0.13**	**0.09**	**0.05**	**0.03**	**0.02**	**0.01**
2010	0.00	0.13	**0.68**	**1.45**	**0.54**	**0.39**	**0.32**	**0.19**	**0.12**	**0.08**	**0.05**	**0.03**	**0.02**	**0.01**	**0.01**
2011	0.00	**0.16**	**0.46**	**0.30**	**0.26**	**0.23**	**0.14**	**0.09**	**0.07**	**0.04**	**0.03**	**0.02**	**0.01**	**0.01**	**0.01**
2012	**0.02**	**0.10**	**0.17**	**0.19**	**0.19**	**0.12**	**0.09**	**0.06**	**0.04**	**0.03**	**0.02**	**0.01**	**0.01**	**0.01**	**0.00**
2013	**0.00**	**0.07**	**0.28**	**0.35**	**0.25**	**0.18**	**0.14**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.01**	**0.01**
2014	**0.00**	**0.11**	**0.43**	**0.41**	**0.31**	**0.23**	**0.16**	**0.12**	**0.10**	**0.07**	**0.06**	**0.04**	**0.03**	**0.02**	**0.01**
2015	**0.00**	**0.12**	**0.35**	**0.37**	**0.31**	**0.23**	**0.19**	**0.16**	**0.13**	**0.09**	**0.06**	**0.04**	**0.03**	**0.02**	**0.01**
2016	**0.00**	**0.09**	**0.30**	**0.33**	**0.25**	**0.21**	**0.18**	**0.14**	**0.10**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.01**
2017	**0.00**	**0.10**	**0.28**	**0.24**	**0.18**	**0.17**	**0.13**	**0.11**	**0.08**	**0.06**	**0.04**	**0.03**	**0.02**	**0.01**	**0.01**
2018	**0.00**	**0.10**	**0.22**	**0.21**	**0.21**	**0.16**	**0.13**	**0.10**	**0.08**	**0.06**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**
2019	**0.00**	**0.09**	**0.23**	**0.27**	**0.22**	**0.17**	**0.14**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.01**

Conditional Prepayment Rates **Fixed Rate 15 Year Streamline Refinance Mortgages** **by Credit Subsidy Endorsement Cohort**

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1992	0.65	9.76	17.93	7.31	11.50	10.12	15.16	17.48	10.81	13.84	20.91	23.73	20.41	19.35	21.88
1993	1.10	6.55	5.65	8.99	9.11	13.12	16.16	10.85	13.53	18.40	25.31	20.29	17.96	19.94	20.03
1994	1.37	3.97	7.05	7.57	10.99	13.69	9.71	12.35	16.30	22.70	19.00	17.12	17.98	17.26	24.90
1995	1.85	9.38	8.28	13.23	17.08	9.91	12.15	18.38	21.98	18.11	14.58	14.08	16.13	13.18	20.29
1996	0.92	4.43	9.74	14.08	9.26	12.58	17.79	26.69	21.80	16.71	16.35	13.54	14.47	17.33	22.51
1997	1.26	9.25	14.45	8.41	11.12	19.16	26.82	21.64	17.60	16.32	13.03	11.59	11.51	15.11	19.52
1998	1.14	7.22	6.36	10.22	16.49	30.17	22.77	16.75	15.50	12.37	12.45	11.41	12.76	15.21	**23.05**
1999	1.33	4.21	8.42	14.14	26.62	21.03	16.34	14.03	11.21	10.34	9.61	10.22	13.38	**20.59**	**18.95**
2000	2.20	12.04	17.70	28.47	25.38	17.79	16.30	12.42	9.83	8.89	8.68	7.38	**18.40**	**21.59**	**20.85**
2001	1.36	13.03	36.65	28.64	21.21	14.08	11.93	10.58	8.19	8.62	8.76	**15.44**	**18.96**	**20.17**	**19.65**
2002	2.73	24.67	21.47	18.67	13.65	10.81	8.89	8.35	8.08	7.82	**14.39**	**16.77**	**17.55**	**18.00**	**16.46**
2003	6.23	12.62	15.33	12.61	10.14	8.35	7.83	7.40	8.16	**13.19**	**14.12**	**14.48**	**15.51**	**15.61**	**13.01**
2004	4.90	11.12	11.02	9.15	7.24	6.33	6.33	6.47	**11.13**	**12.69**	**12.90**	**14.03**	**14.54**	**13.25**	**10.49**
2005	4.43	8.71	8.56	6.49	5.19	5.63	5.82	**12.52**	**15.60**	**15.56**	**16.98**	**17.78**	**16.70**	**15.88**	**15.19**
2006	2.82	7.64	7.10	6.94	5.94	4.95	**13.58**	**16.75**	**16.33**	**17.56**	**18.60**	**17.51**	**17.22**	**18.78**	**15.95**
2007	1.09	8.50	10.96	8.44	5.13	**14.82**	**15.05**	**13.87**	**15.52**	**17.13**	**16.82**	**17.28**	**19.96**	**19.03**	**16.88**
2008	1.23	8.48	8.06	6.73	**15.47**	**12.33**	**10.75**	**12.34**	**13.98**	**13.50**	**13.60**	**15.95**	**16.32**	**16.04**	**16.00**
2009	0.86	5.61	9.95	**16.70**	**10.02**	**7.44**	**8.49**	**9.93**	**9.89**	**10.03**	**12.06**	**12.90**	**13.22**	**14.24**	**12.73**
2010	1.52	8.60	**17.62**	**10.14**	**7.26**	**7.69**	**9.13**	**9.22**	**9.19**	**11.04**	**11.98**	**12.46**	**13.55**	**12.85**	**11.38**
2011	1.46	**36.28**	**12.25**	**7.79**	**8.12**	**9.23**	**8.97**	**8.57**	**10.42**	**11.42**	**11.79**	**13.04**	**12.68**	**12.71**	**11.99**
2012	**3.58**	**10.89**	**6.63**	**8.55**	**9.58**	**8.26**	**7.59**	**9.22**	**10.25**	**10.67**	**11.91**	**11.21**	**11.75**	**12.41**	**11.81**
2013	**6.41**	**13.89**	**17.11**	**15.99**	**11.63**	**10.00**	**12.14**	**12.80**	**12.84**	**14.67**	**13.64**	**14.59**	**15.41**	**15.74**	**13.77**
2014	**11.93**	**33.46**	**25.77**	**17.42**	**15.24**	**13.79**	**13.89**	**13.98**	**14.83**	**14.28**	**16.25**	**17.18**	**18.64**	**17.87**	**17.33**
2015	**15.48**	**36.57**	**23.62**	**21.82**	**19.26**	**16.03**	**16.41**	**17.55**	**16.54**	**17.46**	**17.23**	**18.37**	**19.81**	**20.38**	**18.98**
2016	**13.77**	**29.74**	**26.15**	**24.39**	**19.50**	**15.34**	**15.69**	**14.72**	**15.89**	**14.84**	**16.54**	**17.45**	**17.70**	**17.93**	**16.82**
2017	**12.66**	**29.00**	**26.44**	**18.76**	**13.18**	**12.47**	**12.81**	**12.87**	**12.92**	**14.41**	**14.19**	**15.56**	**17.48**	**19.23**	**17.19**
2018	**12.34**	**28.11**	**21.25**	**14.03**	**13.67**	**12.92**	**11.34**	**12.65**	**12.35**	**13.73**	**14.02**	**14.95**	**17.29**	**16.43**	**13.33**
2019	**11.99**	**23.93**	**19.75**	**19.14**	**13.20**	**11.60**	**14.33**	**13.89**	**14.65**	**14.30**	**14.88**	**16.22**	**15.99**	**14.12**	**10.60**

Cumulative Claim Rates **Fixed Rate 15 Year Streamline Refinance Mortgages** **by Credit Subsidy Endorsement Cohort**

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1992	0.00	0.06	0.16	0.31	0.45	0.54	0.68	0.74	0.78	0.82	0.82	0.83	0.83	0.83	0.83
1993	0.00	0.04	0.14	0.27	0.42	0.52	0.60	0.66	0.70	0.73	0.74	0.74	0.74	0.75	0.75
1994	0.00	0.06	0.26	0.48	0.70	0.86	0.97	1.02	1.07	1.09	1.10	1.11	1.12	1.12	1.12
1995	0.01	0.15	0.55	1.05	1.39	1.61	1.84	1.97	2.05	2.10	2.10	2.14	2.14	2.14	2.15
1996	0.00	0.05	0.19	0.47	0.72	0.94	1.07	1.12	1.20	1.22	1.23	1.24	1.24	1.24	1.24
1997	0.00	0.15	0.33	0.63	0.86	0.97	1.05	1.10	1.17	1.18	1.19	1.19	1.20	1.20	1.20
1998	0.00	0.02	0.15	0.28	0.45	0.52	0.58	0.63	0.64	0.65	0.66	0.67	0.69	0.70	**0.71**
1999	0.00	0.03	0.11	0.18	0.30	0.37	0.42	0.45	0.47	0.48	0.50	0.53	0.54	**0.57**	**0.59**
2000	0.00	0.08	0.19	0.40	0.54	0.62	0.68	0.76	0.82	0.91	0.97	0.97	**1.00**	**1.02**	**1.03**
2001	0.00	0.05	0.13	0.25	0.48	0.57	0.62	0.65	0.71	0.79	0.84	**0.90**	**0.93**	**0.94**	**0.95**
2002	0.00	0.04	0.20	0.30	0.39	0.44	0.49	0.54	0.57	0.64	**0.69**	**0.78**	**0.81**	**0.82**	**0.83**
2003	0.00	0.05	0.15	0.26	0.31	0.39	0.46	0.60	0.69	**0.81**	**0.97**	**1.03**	**1.05**	**1.06**	**1.07**
2004	0.02	0.09	0.24	0.35	0.45	0.60	0.80	0.98	**1.18**	**1.40**	**1.50**	**1.53**	**1.55**	**1.56**	**1.56**
2005	0.01	0.11	0.21	0.38	0.67	1.01	1.26	**1.63**	**1.98**	**2.12**	**2.17**	**2.21**	**2.22**	**2.23**	**2.24**
2006	0.00	0.04	0.13	0.52	0.99	1.25	**1.88**	**2.27**	**2.49**	**2.58**	**2.64**	**2.67**	**2.68**	**2.69**	**2.69**
2007	0.00	0.13	0.38	1.19	1.46	**2.10**	**3.58**	**4.28**	**4.51**	**4.67**	**4.74**	**4.78**	**4.79**	**4.80**	**4.81**
2008	0.00	0.09	0.63	1.36	**2.98**	**4.99**	**5.72**	**6.08**	**6.34**	**6.45**	**6.51**	**6.54**	**6.56**	**6.57**	**6.57**
2009	0.00	0.11	0.51	**1.67**	**3.08**	**3.51**	**3.77**	**3.97**	**4.07**	**4.13**	**4.16**	**4.18**	**4.19**	**4.19**	**4.20**
2010	0.00	0.14	**0.77**	**1.85**	**2.20**	**2.44**	**2.62**	**2.72**	**2.77**	**2.81**	**2.82**	**2.84**	**2.84**	**2.85**	**2.85**
2011	0.00	**0.16**	**0.45**	**0.61**	**0.74**	**0.85**	**0.91**	**0.94**	**0.97**	**0.98**	**0.99**	**0.99**	**1.00**	**1.00**	**1.00**
2012	**0.02**	**0.12**	**0.26**	**0.42**	**0.56**	**0.64**	**0.69**	**0.73**	**0.75**	**0.77**	**0.77**	**0.78**	**0.78**	**0.79**	**0.79**
2013	**0.00**	**0.07**	**0.29**	**0.53**	**0.67**	**0.75**	**0.82**	**0.85**	**0.87**	**0.89**	**0.90**	**0.90**	**0.91**	**0.91**	**0.91**
2014	**0.00**	**0.10**	**0.35**	**0.53**	**0.64**	**0.71**	**0.75**	**0.77**	**0.79**	**0.80**	**0.81**	**0.82**	**0.82**	**0.82**	**0.82**
2015	**0.00**	**0.11**	**0.30**	**0.44**	**0.54**	**0.60**	**0.64**	**0.67**	**0.69**	**0.70**	**0.70**	**0.71**	**0.71**	**0.71**	**0.71**
2016	**0.00**	**0.09**	**0.27**	**0.42**	**0.50**	**0.55**	**0.59**	**0.62**	**0.64**	**0.64**	**0.65**	**0.65**	**0.66**	**0.66**	**0.66**
2017	**0.00**	**0.09**	**0.27**	**0.37**	**0.44**	**0.49**	**0.53**	**0.56**	**0.57**	**0.58**	**0.59**	**0.59**	**0.59**	**0.60**	**0.60**
2018	**0.00**	**0.10**	**0.24**	**0.34**	**0.42**	**0.48**	**0.52**	**0.55**	**0.57**	**0.58**	**0.59**	**0.60**	**0.60**	**0.60**	**0.60**
2019	**0.00**	**0.09**	**0.24**	**0.39**	**0.49**	**0.55**	**0.60**	**0.63**	**0.65**	**0.67**	**0.67**	**0.68**	**0.68**	**0.69**	**0.69**

Cumulative Prepayment Rates **Fixed Rate 15 Year Streamline Refinance Mortgages** **by Credit Subsidy Endorsement Cohort**

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1992	0.66	10.58	26.75	32.21	40.13	46.29	54.59	62.63	66.73	71.47	77.64	83.17	86.78	89.55	92.53
1993	1.12	7.71	13.03	20.99	28.34	37.94	48.14	53.89	60.33	67.85	76.40	81.39	84.95	88.23	92.16
1994	1.40	5.39	12.18	18.96	28.02	38.00	44.12	51.18	59.30	68.87	75.04	79.51	83.42	86.64	93.48
1995	1.88	11.25	18.70	29.60	41.67	47.45	53.85	62.22	70.39	75.67	79.26	82.09	84.92	86.94	92.27
1996	0.93	5.40	14.79	26.96	33.82	42.27	52.64	65.44	73.01	77.57	81.35	83.89	86.30	88.86	92.94
1997	1.28	10.58	23.66	30.17	38.06	50.00	63.52	71.40	76.45	80.31	83.10	85.12	87.16	89.30	93.04
1998	1.16	8.42	14.36	23.30	36.16	55.80	66.00	71.78	76.23	79.29	82.06	84.21	86.39	88.69	**91.87**
1999	1.35	5.59	13.71	26.14	46.22	57.73	64.75	69.83	73.32	76.24	78.80	81.12	83.94	**87.74**	**90.86**
2000	2.24	14.19	29.56	49.92	62.77	69.45	74.44	77.61	79.80	81.87	83.77	84.99	**87.89**	**90.77**	**93.16**
2001	1.38	14.50	46.40	61.97	70.15	74.38	77.45	79.84	81.54	83.17	84.83	**87.23**	**89.74**	**91.91**	**93.73**
2002	2.78	27.29	43.17	53.96	60.33	64.67	67.89	70.67	73.12	75.44	**79.28**	**82.93**	**86.10**	**88.87**	**91.15**
2003	6.36	18.43	31.19	40.02	46.23	50.81	54.79	58.27	61.84	**67.15**	**71.96**	**76.14**	**80.03**	**83.42**	**86.12**
2004	5.09	15.86	25.30	32.28	37.29	41.38	45.21	48.93	**54.88**	**60.81**	**65.93**	**70.80**	**75.20**	**78.79**	**81.57**
2005	4.61	13.09	20.67	25.93	29.86	33.91	37.87	**45.93**	**54.54**	**61.72**	**68.05**	**73.41**	**77.58**	**81.01**	**84.01**
2006	2.88	10.45	16.91	22.78	27.46	31.12	**40.73**	**50.78**	**58.87**	**66.13**	**71.98**	**76.34**	**79.92**	**83.24**	**85.81**
2007	1.10	9.65	19.70	26.52	30.30	**40.81**	**49.71**	**56.46**	**62.87**	**68.78**	**73.44**	**77.38**	**81.16**	**84.11**	**86.45**
2008	1.25	9.79	17.19	22.84	**34.87**	**42.74**	**48.55**	**54.41**	**60.18**	**64.94**	**69.06**	**73.21**	**76.81**	**79.84**	**82.61**
2009	0.88	6.57	16.02	**30.23**	**37.22**	**41.79**	**46.60**	**51.72**	**56.30**	**60.49**	**65.04**	**69.31**	**73.17**	**76.88**	**80.00**
2010	1.57	10.21	**26.25**	**33.81**	**38.60**	**43.29**	**48.42**	**53.11**	**57.37**	**62.04**	**66.53**	**70.67**	**74.67**	**78.10**	**81.23**
2011	1.50	**37.64**	**45.40**	**49.70**	**53.84**	**58.16**	**61.95**	**65.26**	**68.95**	**72.58**	**75.91**	**79.18**	**81.98**	**84.55**	**86.93**
2012	**3.67**	**14.32**	**20.12**	**27.08**	**34.20**	**39.73**	**44.41**	**49.68**	**55.01**	**59.98**	**64.95**	**69.12**	**73.07**	**76.89**	**80.49**
2013	**6.52**	**19.65**	**33.58**	**44.30**	**50.82**	**55.78**	**61.19**	**66.21**	**70.60**	**74.97**	**78.44**	**81.68**	**84.63**	**87.25**	**89.47**
2014	**12.12**	**41.93**	**57.07**	**64.59**	**70.02**	**74.15**	**77.75**	**80.86**	**83.70**	**86.04**	**88.33**	**90.34**	**92.15**	**93.62**	**94.92**
2015	**15.77**	**47.02**	**59.68**	**68.60**	**74.68**	**78.75**	**82.22**	**85.32**	**87.72**	**89.81**	**91.52**	**93.02**	**94.36**	**95.51**	**96.43**
2016	**14.05**	**39.98**	**55.93**	**66.79**	**73.31**	**77.41**	**80.94**	**83.74**	**86.30**	**88.30**	**90.21**	**91.91**	**93.35**	**94.57**	**95.63**
2017	**12.90**	**38.56**	**55.05**	**63.59**	**68.44**	**72.40**	**75.96**	**79.06**	**81.75**	**84.37**	**86.60**	**88.69**	**90.72**	**92.61**	**94.12**
2018	**12.57**	**37.48**	**50.96**	**57.90**	**63.69**	**68.37**	**71.97**	**75.51**	**78.53**	**81.49**	**84.09**	**86.50**	**88.91**	**90.83**	**92.25**
2019	**12.22**	**33.58**	**46.89**	**57.16**	**62.82**	**67.15**	**71.87**	**75.78**	**79.34**	**82.29**	**84.93**	**87.39**	**89.43**	**90.99**	**92.12**

Conditional Claim Rates Adjustable Rate Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1991	0.02	0.13	0.63	1.04	1.40	1.63	2.25	2.42	1.88	1.58	0.91	0.44	0.45	0.51	0.13	0.15	0.15	0.07	0.24	0.29	0.11	**0.28**	**0.50**	**0.30**	**0.18**	**0.27**	**0.26**	**0.23**	**0.20**	**0.15**
1992	0.00	0.16	0.66	1.10	1.62	2.34	2.36	1.92	1.60	0.84	0.61	0.58	0.36	0.26	0.20	0.11	0.18	0.27	0.21	0.17	**0.43**	**0.66**	**0.41**	**0.20**	**0.30**	**0.29**	**0.27**	**0.24**	**0.20**	**0.16**
1993	0.00	0.15	0.72	1.38	2.65	2.47	2.19	1.79	1.06	0.74	0.75	0.47	0.28	0.27	0.24	0.23	0.33	0.51	0.31	**0.53**	**0.88**	**0.48**	**0.21**	**0.32**	**0.31**	**0.29**	**0.26**	**0.22**	**0.18**	**0.13**
1994	0.00	0.17	0.92	2.15	2.75	2.65	1.98	1.10	0.91	0.93	0.69	0.37	0.37	0.22	0.25	0.31	0.51	0.48	**0.66**	**1.14**	**0.66**	**0.36**	**0.53**	**0.50**	**0.45**	**0.40**	**0.34**	**0.30**	**0.25**	**0.20**
1995	0.01	0.34	1.83	3.20	4.09	3.16	2.04	1.84	2.10	1.56	0.99	0.77	0.49	0.66	0.74	1.11	0.86	**1.13**	**1.87**	**1.20**	**0.62**	**0.87**	**0.83**	**0.75**	**0.66**	**0.55**	**0.49**	**0.40**	**0.33**	**0.27**
1996	0.00	0.33	1.75	3.78	3.96	2.72	2.79	3.18	2.13	1.37	1.09	0.70	1.23	1.17	1.23	1.42	**1.88**	**2.75**	**1.32**	**0.78**	**1.10**	**1.03**	**0.94**	**0.84**	**0.69**	**0.62**	**0.51**	**0.44**	**0.41**	**0.32**
1997	0.01	0.42	2.00	3.30	2.91	3.53	3.88	2.56	1.78	1.38	1.26	1.44	1.51	1.64	1.40	**2.19**	**3.07**	**1.65**	**0.90**	**1.27**	**1.19**	**1.07**	**0.94**	**0.78**	**0.69**	**0.57**	**0.50**	**0.47**	**0.38**	**0.29**
1998	0.01	0.79	2.24	2.49	2.98	3.60	2.65	1.91	1.50	1.31	1.63	1.54	2.10	1.46	**2.35**	**3.24**	**1.55**	**1.00**	**1.42**	**1.32**	**1.20**	**1.04**	**0.85**	**0.75**	**0.63**	**0.57**	**0.55**	**0.45**	**0.38**	**0.28**
1999	0.00	0.23	0.84	1.99	3.18	2.83	1.77	1.56	1.63	1.35	2.66	2.66	2.19	**3.37**	**4.16**	**2.23**	**1.34**	**1.83**	**1.67**	**1.49**	**1.32**	**1.06**	**0.91**	**0.76**	**0.69**	**0.67**	**0.56**	**0.48**	**0.39**	**0.29**
2000	0.01	0.51	1.68	3.26	2.99	2.37	2.00	2.15	2.83	3.42	3.03	2.64	**3.79**	**5.48**	**2.79**	**2.05**	**2.69**	**2.37**	**2.06**	**1.77**	**1.41**	**1.21**	**1.02**	**0.97**	**0.92**	**0.74**	**0.63**	**0.52**	**0.42**	**0.31**
2001	0.00	0.33	1.25	1.87	1.47	2.12	2.05	2.86	3.79	3.73	3.52	**4.66**	**6.17**	**2.53**	**2.26**	**2.89**	**2.54**	**2.24**	**1.89**	**1.47**	**1.24**	**1.04**	**0.94**	**0.88**	**0.73**	**0.63**	**0.52**	**0.42**	**0.33**	**0.26**
2002	0.00	0.23	1.45	1.85	2.20	2.85	4.61	5.25	5.03	4.57	**5.97**	**7.32**	**3.06**	**2.69**	**3.33**	**2.83**	**2.45**	**2.04**	**1.59**	**1.33**	**1.11**	**1.02**	**0.99**	**0.80**	**0.67**	**0.55**	**0.46**	**0.37**	**0.31**	**0.23**
2003	0.01	0.54	1.48	2.13	3.56	5.37	5.75	6.17	4.35	**6.34**	**7.70**	**3.02**	**2.98**	**3.77**	**3.24**	**2.85**	**2.35**	**1.80**	**1.49**	**1.23**	**1.11**	**1.12**	**0.93**	**0.77**	**0.63**	**0.52**	**0.43**	**0.36**	**0.29**	**0.22**
2004	0.08	0.64	1.61	3.05	5.54	6.28	5.80	4.69	**6.96**	**8.37**	**3.70**	**3.38**	**4.25**	**3.62**	**3.17**	**2.60**	**2.00**	**1.65**	**1.35**	**1.20**	**1.17**	**0.98**	**0.84**	**0.69**	**0.58**	**0.49**	**0.42**	**0.34**	**0.30**	**0.21**
2005	0.09	0.86	2.43	5.06	6.42	6.95	4.98	**7.87**	**11.39**	**4.80**	**4.88**	**5.86**	**4.82**	**4.12**	**3.33**	**2.58**	**2.15**	**1.81**	**1.66**	**1.58**	**1.25**	**1.08**	**0.91**	**0.75**	**0.63**	**0.54**	**0.44**	**0.38**	**0.30**	**0.20**
2006	0.02	1.12	3.46	6.96	9.01	7.04	**9.20**	**11.78**	**5.23**	**4.96**	**5.96**	**4.77**	**3.99**	**3.13**	**2.41**	**1.99**	**1.70**	**1.58**	**1.39**	**1.09**	**0.94**	**0.79**	**0.65**	**0.55**	**0.47**	**0.38**	**0.34**	**0.27**	**0.21**	**0.17**
2007	0.00	1.02	4.98	9.73	9.01	**10.79**	**13.09**	**6.21**	**5.58**	**6.51**	**5.02**	**4.12**	**3.22**	**2.48**	**2.05**	**1.73**	**1.65**	**1.44**	**1.10**	**0.94**	**0.79**	**0.65**	**0.53**	**0.46**	**0.38**	**0.33**	**0.27**	**0.22**	**0.19**	**0.13**
2008	0.01	0.57	4.08	6.76	**10.18**	**12.67**	**6.27**	**4.41**	**4.84**	**3.69**	**3.00**	**2.35**	**1.80**	**1.52**	**1.31**	**1.28**	**1.13**	**0.88**	**0.77**	**0.65**	**0.52**	**0.44**	**0.39**	**0.32**	**0.28**	**0.23**	**0.19**	**0.17**	**0.13**	**0.10**
2009	0.09	0.93	2.45	**4.34**	**7.19**	**3.49**	**3.77**	**4.77**	**4.04**	**3.52**	**2.90**	**2.32**	**2.03**	**1.80**	**1.87**	**1.82**	**1.39**	**1.17**	**0.98**	**0.82**	**0.68**	**0.59**	**0.50**	**0.45**	**0.37**	**0.30**	**0.28**	**0.23**	**0.19**	**0.14**
2010	0.01	0.17	**0.93**	**2.24**	**1.54**	**2.53**	**3.78**	**3.51**	**3.27**	**2.80**	**2.32**	**2.12**	**1.86**	**1.93**	**2.12**	**1.69**	**1.40**	**1.16**	**0.99**	**0.81**	**0.72**	**0.61**	**0.57**	**0.46**	**0.38**	**0.35**	**0.29**	**0.25**	**0.20**	**0.16**
2011	0.00	**0.19**	**0.90**	**1.16**	**2.30**	**3.66**	**3.61**	**3.47**	**3.02**	**2.54**	**2.38**	**2.10**	**2.14**	**2.51**	**2.01**	**1.64**	**1.34**	**1.15**	**0.92**	**0.82**	**0.70**	**0.66**	**0.54**	**0.44**	**0.41**	**0.35**	**0.30**	**0.26**	**0.23**	**0.17**
2012	**0.01**	**0.25**	**0.72**	**2.08**	**3.69**	**3.88**	**3.91**	**3.48**	**2.97**	**2.82**	**2.46**	**2.41**	**2.94**	**2.45**	**1.98**	**1.58**	**1.37**	**1.08**	**0.95**	**0.82**	**0.78**	**0.63**	**0.51**	**0.48**	**0.42**	**0.37**	**0.32**	**0.29**	**0.23**	**0.17**
2013	**0.01**	**0.23**	**1.61**	**3.95**	**4.47**	**4.50**	**4.04**	**3.51**	**3.39**	**2.97**	**3.34**	**4.06**	**3.13**	**2.42**	**1.91**	**1.62**	**1.29**	**1.15**	**0.98**	**0.93**	**0.77**	**0.64**	**0.60**	**0.51**	**0.45**	**0.40**	**0.35**	**0.29**	**0.24**	**0.18**
2014	**0.01**	**0.50**	**2.65**	**4.73**	**5.27**	**4.91**	**4.46**	**4.42**	**4.76**	**5.34**	**4.59**	**3.22**	**2.69**	**2.29**	**1.91**	**1.62**	**1.47**	**1.25**	**1.17**	**1.00**	**0.87**	**0.82**	**0.69**	**0.60**	**0.53**	**0.47**	**0.38**	**0.32**	**0.27**	**0.21**
2015	**0.02**	**0.56**	**2.26**	**4.32**	**4.84**	**4.84**	**5.19**	**5.24**	**4.49**	**3.82**	**3.26**	**3.03**	**2.69**	**2.24**	**1.98**	**1.84**	**1.60**	**1.51**	**1.28**	**1.13**	**1.08**	**0.90**	**0.79**	**0.70**	**0.61**	**0.49**	**0.43**	**0.38**	**0.31**	**0.25**
2016	**0.02**	**0.49**	**2.13**	**3.84**	**4.45**	**4.90**	**5.43**	**5.67**	**4.89**	**3.87**	**3.53**	**3.05**	**2.59**	**2.33**	**2.21**	**1.94**	**1.76**	**1.48**	**1.32**	**1.24**	**1.04**	**0.91**	**0.83**	**0.74**	**0.59**	**0.53**	**0.46**	**0.39**	**0.34**	**0.25**
2017	**0.02**	**0.52**	**2.05**	**3.67**	**4.65**	**5.84**	**6.17**	**5.34**	**4.31**	**4.07**	**3.45**	**2.94**	**2.64**	**2.50**	**2.20**	**1.97**	**1.63**	**1.51**	**1.40**	**1.16**	**1.04**	**0.94**	**0.85**	**0.70**	**0.61**	**0.54**	**0.46**	**0.42**	**0.32**	**0.24**
2018	**0.02**	**0.53**	**1.99**	**3.92**	**5.33**	**5.55**	**5.22**	**4.63**	**4.47**	**3.86**	**3.32**	**2.98**	**2.81**	**2.44**	**2.16**	**1.83**	**1.73**	**1.60**	**1.31**	**1.22**	**1.09**	**1.01**	**0.82**	**0.71**	**0.64**	**0.55**	**0.51**	**0.39**	**0.31**	**0.24**
2019	**0.02**	**0.54**	**2.32**	**4.42**	**4.90**	**5.07**	**5.03**	**5.08**	**4.50**	**3.80**	**3.46**	**3.24**	**2.80**	**2.48**	**2.13**	**2.03**	**1.94**	**1.58**	**1.49**	**1.31**	**1.22**	**1.01**	**0.93**	**0.86**	**0.71**	**0.65**	**0.49**	**0.40**	**0.34**	**0.25**

Conditional Prepayment Rates Adjustable Rate Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1991	0.22	1.99	6.57	8.80	7.04	11.56	11.49	17.18	18.70	12.79	21.85	24.94	25.99	21.52	16.50	21.44	13.89	8.54	7.34	3.70	3.59	**3.20**	**1.32**	**0.65**	**0.81**	**1.02**	**1.07**	**0.96**	**0.89**	**0.72**
1992	0.22	3.13	6.82	7.04	13.15	11.88	19.89	20.20	13.11	21.75	24.24	27.20	22.24	17.42	17.13	14.54	10.60	5.74	4.95	4.01	**4.00**	**1.50**	**0.73**	**0.95**	**1.29**	**1.31**	**1.17**	**1.15**	**1.00**	**0.78**
1993	0.44	3.41	5.30	12.90	10.96	19.64	20.42	12.82	25.06	27.30	30.07	25.32	20.56	17.45	16.42	10.48	6.34	4.88	3.77	**3.33**	**1.77**	**0.84**	**1.10**	**1.51**	**1.59**	**1.41**	**1.39**	**1.24**	**1.05**	**0.84**
1994	0.30	2.47	9.91	11.38	21.39	20.47	12.98	25.52	27.04	31.16	26.70	21.84	19.48	16.61	11.21	5.08	4.38	3.69	**3.86**	**1.99**	**0.99**	**1.29**	**1.74**	**1.81**	**1.64**	**1.60**	**1.44**	**1.29**	**1.13**	**0.72**
1995	1.70	10.18	15.64	31.41	23.17	13.53	25.49	26.48	28.56	26.79	23.76	21.50	17.75	10.27	5.17	3.70	2.47	**3.39**	**2.18**	**1.12**	**1.45**	**1.92**	**1.93**	**1.74**	**1.71**	**1.56**	**1.38**	**1.23**	**0.87**	**0.70**
1996	0.48	6.04	34.07	32.33	15.78	30.27	27.38	27.68	27.01	23.50	21.49	18.88	11.61	5.39	3.87	2.56	**3.69**	**2.34**	**1.21**	**1.64**	**2.16**	**2.18**	**1.97**	**1.96**	**1.77**	**1.58**	**1.47**	**1.07**	**0.95**	**0.73**
1997	0.93	18.35	34.36	18.61	36.91	27.39	27.59	25.73	23.21	21.85	19.13	12.31	5.64	3.92	2.57	**3.32**	**2.64**	**1.39**	**1.84**	**2.44**	**2.52**	**2.31**	**2.30**	**2.14**	**1.91**	**1.72**	**1.26**	**1.16**	**0.98**	**0.73**
1998	2.82	20.60	17.25	36.98	28.94	28.04	27.20	25.13	23.42	22.15	13.73	6.96	3.90	3.08	**3.66**	**2.83**	**1.48**	**1.98**	**2.66**	**2.80**	**2.52**	**2.47**	**2.34**	**2.08**	**1.88**	**1.41**	**1.28**	**1.12**	**0.91**	**0.64**
1999	0.39	3.97	32.47	31.26	30.32	25.77	27.76	27.01	26.84	17.11	7.17	4.41	2.92	**3.94**	**3.04**	**1.69**	**2.32**	**3.16**	**3.33**	**3.14**	**3.14**	**2.77**	**2.41**	**2.29**	**1.75**	**1.61**	**1.46**	**1.20**	**0.98**	**0.79**
2000	1.07	33.05	31.03	29.24	24.68	26.83	26.19	26.33	16.99	6.57	4.52	2.26	**4.20**	**3.05**	**1.71**	**2.35**	**3.23**	**3.34**	**3.09**	**3.11**	**2.99**	**2.70**	**2.44**	**1.83**	**1.76**	**1.56**	**1.31**	**1.08**	**0.92**	**0.71**
2001	4.97	20.07	29.67	26.03	31.55	30.77	30.52	17.99	8.36	4.94	3.23	**4.22**	**3.00**	**1.71**	**2.40**	**3.40**	**3.55**	**3.39**	**3.59**	**3.41**	**3.16**	**2.88**	**2.11**	**2.04**	**1.82**	**1.53**	**1.28**	**1.11**	**0.96**	**0.77**
2002	2.34	27.54	23.94	31.08	31.82	33.10	19.82	7.21	4.71	2.46	**3.28**	**2.78**	**1.64**	**2.46**	**3.53**	**3.91**	**3.72**	**3.89**	**3.79**	**3.46**	**3.19**	**2.48**	**2.33**	**2.11**	**1.84**	**1.57**	**1.38**	**1.17**	**0.99**	**0.75**
2003	8.03	22.25	33.99	35.40	34.77	20.59	7.16	4.09	3.14	**3.39**	**2.78**	**1.62**	**2.46**	**3.63**	**4.19**	**4.12**	**4.27**	**4.12**	**3.80**	**3.49**	**2.68**	**2.52**	**2.37**	**2.07**	**1.76**	**1.58**	**1.39**	**1.19**	**0.97**	**0.73**
2004	6.57	29.81	34.49	34.30	19.56	7.27	4.06	2.14	**3.35**	**2.68**	**1.57**	**2.53**	**3.98**	**4.58**	**4.51**	**4.81**	**4.69**	**4.44**	**4.04**	**3.11**	**2.94**	**2.73**	**2.36**	**2.05**	**1.85**	**1.67**	**1.44**	**1.20**	**0.99**	**0.73**
2005	9.18	22.06	25.69	19.13	7.01	3.59	1.80	**2.51**	**2.08**	**1.29**	**2.23**	**3.65**	**4.27**	**4.28**	**4.71**	**4.78**	**4.51**	**4.19**	**3.33**	**3.23**	**2.94**	**2.61**	**2.28**	**2.09**	**1.87**	**1.63**	**1.39**	**1.22**	**1.03**	**0.66**
2006	2.39	12.75	17.85	14.60	5.49	2.27	**2.32**	**1.73**	**1.08**	**1.99**	**3.30**	**3.89**	**4.00**	**4.48**	**4.63**	**4.59**	**4.37**	**3.46**	**3.22**	**3.00**	**2.72**	**2.47**	**2.24**	**1.96**	**1.69**	**1.47**	**1.32**	**1.16**	**0.83**	**0.70**
2007	1.59	11.62	19.31	12.00	4.39	**3.95**	**1.54**	**0.99**	**1.87**	**3.48**	**4.20**	**4.00**	**4.31**	**4.74**	**4.55**	**4.38**	**3.48**	**3.23**	**3.05**	**2.74**	**2.48**	**2.31**	**2.06**	**1.81**	**1.53**	**1.40**	**1.21**	**0.89**	**0.84**	**0.71**
2008	0.56	25.20	19.77	13.15	**7.09**	**1.88**	**1.24**	**2.54**	**4.55**	**5.52**	**5.58**	**6.32**	**6.47**	**6.06**	**5.67**	**4.48**	**4.32**	**4.00**	**3.49**	**3.04**	**2.86**	**2.58**	**2.28**	**1.98**	**1.82**	**1.61**	**1.21**	**1.20**	**1.16**	**0.96**
2009	12.76	19.88	16.79	**10.90**	**4.72**	**2.66**	**4.87**	**8.03**	**9.26**	**9.10**	**9.93**	**9.71**	**8.68**	**7.87**	**6.21**	**5.86**	**5.51**	**4.95**	**4.36**	**4.04**	**3.49**	**3.11**	**2.73**	**2.61**	**2.25**	**1.66**	**1.62**	**1.58**	**1.34**	**0.97**
2010	2.29	8.07	**11.06**	**8.43**	**4.50**	**7.69**	**12.03**	**13.65**	**13.32**	**14.21**	**13.53**	**12.13**	**10.74**	**8.40**	**7.82**	**7.49**	**6.80**	**6.02**	**5.70**	**4.91**	**4.39**	**3.81**	**3.76**	**3.21**	**2.36**	**2.27**	**2.18**	**1.87**	**1.49**	**1.30**
2011	1.54	**16.40**	**15.29**	**7.81**	**12.03**	**17.10**	**18.45**	**17.59**	**18.28**	**16.71**	**14.74**	**12.87**	**9.97**	**9.21**	**8.90**	**8.29**	**7.45**	**7.14**	**6.01**	**5.49**	**4.83**	**4.93**	**4.12**	**2.99**	**2.87**	**2.80**	**2.39**	**1.98**	**1.93**	**1.47**
2012	**4.36**	**15.28**	**9.17**	**15.42**	**20.77**	**21.46**	**20.05**	**20.45**	**18.58**	**16.17**	**14.07**	**10.69**	**9.89**	**9.61**	**8.81**	**8.04**	**7.75**	**6.40**	**5.95**	**5.28**	**5.36**	**4.36**	**3.20**	**3.10**	**3.05**	**2.69**	**2.29**	**2.32**	**1.94**	**1.43**
2013	**3.81**	**11.28**	**19.95**	**24.66**	**23.48**	**20.63**	**20.71**	**18.76**	**16.54**	**14.24**	**11.03**	**10.44**	**9.95**	**9.16**	**8.24**	**7.98**	**6.61**	**6.03**	**5.49**	**5.54**	**4.79**	**3.45**	**3.31**	**3.20**	**2.82**	**2.39**	**2.33**	**1.95**	**1.68**	**1.38**
2014	**3.43**	**23.12**	**30.03**	**26.69**	**22.15**	**20.70**	**18.58**	**16.82**	**14.35**	**11.21**	**10.79**	**10.45**	**9.89**	**8.86**	**8.44**	**6.79**	**6.20**	**5.62**	**5.68**	**5.08**	**3.55**	**3.37**	**3.26**	**2.86**	**2.43**	**2.38**	**1.87**	**1.71**	**1.62**	**1.17**
2015	**4.09**	**27.95**	**32.10**	**28.22**	**24.75**	**21.92**	**19.60**	**16.80**	**13.24**	**12.65**	**11.74**	**11.27**	**9.89**	**9.54**	**8.02**	**6.99**	**6.54**	**6.98**	**6.50**	**4.53**	**4.36**	**4.21**	**3.41**	**2.77**	**3.00**	**2.31**	**2.16**	**2.04**	**1.57**	**1.14**
2016	**4.67**	**27.10**	**33.93**	**30.58**	**25.93**	**21.57**	**18.22**	**14.67**	**13.89**	**12.99**	**13.36**	**11.38**	**10.57**	**9.24**	**8.48**	**7.72**	**7.86**	**7.15**	**5.20**	**5.09**	**4.93**	**3.77**	**3.06**	**3.53**	**2.98**	**2.62**	**2.25**	**1.81**	**1.49**	**1.17**
2017	**4.67**	**29.03**	**34.57**	**30.05**	**22.74**	**19.18**	**16.46**	**14.41**	**13.67**	**13.95**	**12.10**	**11.45**	**10.32**	**9.95**	**8.90**	**9.19**	**7.31**	**5.84**	**5.55**	**5.20**	**4.01**	**3.28**	**3.80**	**3.79**	**3.07**	**2.44**	**1.96**	**1.76**	**1.56**	**1.18**
2018	**4.53**	**29.68**	**33.71**	**27.82**	**22.84**	**19.00**	**15.85**	**14.98**	**14.70**	**12.93**	**12.11**	**10.58**	**10.06**	**8.96**	**8.91**	**7.24**	**5.87**	**5.67**	**5.46**	**4.23**	**3.35**	**3.99**	**4.32**	**3.18**	**2.54**	**2.11**	**1.99**	**1.77**	**1.44**	**1.30**
2019	**5.26**	**28.31**	**34.52**	**28.74**	**21.31**	**17.80**	**17.22**	**16.01**	**14.19**	**13.59**	**11.23**	**10.58**	**9.72**	**9.89**	**7.87**	**6.41**	**6.65**	**6.39**	**5.02**	**3.71**	**4.24**	**4.41**	**3.43**	**2.90**	**2.54**	**2.36**	**2.09**	**1.70**	**1.75**	**1.01**

Cumulative Claim Rates Adjustable Rate Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1991	0.02	0.14	0.76	1.70	2.85	4.08	5.54	6.90	7.74	8.31	8.59	8.69	8.77	8.83	8.85	8.86	8.87	8.87	8.89	8.90	8.91	**8.92**	**8.94**	**8.95**	**8.96**	**8.97**	**8.98**	**8.99**	**9.00**	**9.01**
1992	0.00	0.16	0.81	1.79	3.12	4.76	6.18	7.08	7.66	7.92	8.06	8.16	8.21	8.24	8.25	8.26	8.27	8.29	8.30	8.30	**8.32**	**8.35**	**8.37**	**8.38**	**8.39**	**8.40**	**8.41**	**8.42**	**8.43**	**8.44**
1993	0.00	0.16	0.85	2.10	4.15	5.81	6.95	7.67	8.03	8.22	8.36	8.41	8.44	8.46	8.48	8.49	8.50	8.52	8.54	**8.56**	**8.59**	**8.61**	**8.61**	**8.63**	**8.64**	**8.65**	**8.66**	**8.66**	**8.67**	**8.68**
1994	0.00	0.17	1.07	2.94	5.00	6.50	7.36	7.77	8.02	8.20	8.29	8.33	8.35	8.37	8.38	8.39	8.41	8.43	**8.46**	**8.50**	**8.52**	**8.53**	**8.55**	**8.57**	**8.58**	**8.60**	**8.61**	**8.62**	**8.62**	**8.63**
1995	0.01	0.35	1.96	4.29	6.24	7.33	7.91	8.29	8.61	8.77	8.84	8.88	8.90	8.93	8.95	8.98	9.01	**9.04**	**9.09**	**9.12**	**9.13**	**9.15**	**9.17**	**9.19**	**9.20**	**9.22**	**9.23**	**9.23**	**9.24**	**9.25**
1996	0.00	0.33	1.97	4.23	5.74	6.57	7.14	7.60	7.81	7.90	7.96	7.99	8.03	8.06	8.10	8.13	**8.18**	**8.24**	**8.27**	**8.28**	**8.31**	**8.33**	**8.35**	**8.36**	**8.37**	**8.38**	**8.39**	**8.40**	**8.41**	**8.42**
1997	0.01	0.42	2.03	3.72	4.89	5.73	6.38	6.67	6.81	6.89	6.95	7.01	7.05	7.10	7.14	**7.20**	**7.28**	**7.32**	**7.34**	**7.37**	**7.39**	**7.42**	**7.44**	**7.45**	**7.46**	**7.48**	**7.48**	**7.49**	**7.50**	**7.51**
1998	0.01	0.78	2.50	4.03	5.14	6.05	6.51	6.74	6.87	6.96	7.04	7.11	7.19	7.24	**7.32**	**7.43**	**7.48**	**7.51**	**7.55**	**7.59**	**7.62**	**7.65**	**7.67**	**7.69**	**7.70**	**7.71**	**7.73**	**7.74**	**7.75**	**7.75**
1999	0.00	0.23	1.04	2.31	3.66	4.46	4.81	5.03	5.20	5.29	5.45	5.59	5.70	**5.85**	**6.03**	**6.12**	**6.17**	**6.24**	**6.30**	**6.35**	**6.39**	**6.42**	**6.45**	**6.47**	**6.49**	**6.51**	**6.52**	**6.54**	**6.55**	**6.55**
2000	0.01	0.52	1.62	3.07	3.96	4.47	4.77	5.01	5.23	5.44	5.61	5.75	**5.93**	**6.18**	**6.30**	**6.38**	**6.48**	**6.56**	**6.63**	**6.69**	**6.73**	**6.77**	**6.80**	**6.82**	**6.85**	**6.86**	**6.88**	**6.89**	**6.91**	**6.91**
2001	0.00	0.32	1.27	2.25	2.80	3.34	3.68	4.00	4.34	4.64	4.89	**5.20**	**5.58**	**5.72**	**5.84**	**5.99**	**6.11**	**6.21**	**6.29**	**6.35**	**6.39**	**6.43**	**6.46**	**6.49**	**6.51**	**6.53**	**6.55**	**6.57**	**6.58**	**6.59**
2002	0.00	0.23	1.26	2.24	3.01	3.67	4.35	4.94	5.43	5.83	**6.32**	**6.87**	**7.07**	**7.24**	**7.44**	**7.60**	**7.73**	**7.83**	**7.90**	**7.96**	**8.01**	**8.05**	**8.09**	**8.12**	**8.14**	**8.16**	**8.18**	**8.19**	**8.20**	**8.21**
2003	0.01	0.51	1.57	2.54	3.56	4.50	5.24	5.94	6.38	**6.98**	**7.63**	**7.86**	**8.07**	**8.33**	**8.54**	**8.70**	**8.83**	**8.92**	**8.99**	**9.05**	**9.09**	**9.14**	**9.18**	**9.21**	**9.23**	**9.25**	**9.27**	**9.28**	**9.29**	**9.30**
2004	0.08	0.68	1.73	3.00	4.43	5.64	6.62	7.32	**8.31**	**9.36**	**9.77**	**10.13**	**10.56**	**10.89**	**11.15**	**11.35**	**11.50**	**11.61**	**11.69**	**11.76**	**11.83**	**11.88**	**11.92**	**11.96**	**11.99**	**12.01**	**12.03**	**12.05**	**12.07**	**12.08**
2005	0.09	0.87	2.57	5.12	7.57	9.86	11.33	**13.50**	**16.30**	**17.32**	**18.30**	**19.38**	**20.19**	**20.82**	**21.28**	**21.61**	**21.86**	**22.06**	**22.23**	**22.39**	**22.51**	**22.60**	**22.68**	**22.75**	**22.80**	**22.84**	**22.88**	**22.91**	**22.94**	**22.96**
2006	0.02	1.13	4.05	8.67	13.36	16.49	**20.21**	**24.42**	**26.03**	**27.46**	**29.06**	**30.22**	**31.11**	**31.74**	**32.20**	**32.55**	**32.82**	**33.06**	**33.26**	**33.41**	**33.54**	**33.64**	**33.72**	**33.79**	**33.85**	**33.89**	**33.93**	**33.96**	**33.99**	**34.02**
2007	0.00	1.02	5.33	11.70	16.31	**21.08**	**26.01**	**28.01**	**29.67**	**31.46**	**32.71**	**33.63**	**34.29**	**34.76**	**35.12**	**35.41**	**35.66**	**35.87**	**36.02**	**36.15**	**36.25**	**36.33**	**36.40**	**36.46**	**36.50**	**36.54**	**36.57**	**36.60**	**36.62**	**36.64**
2008	0.01	0.58	3.61	7.43	**12.04**	**16.77**	**18.76**	**20.06**	**21.39**	**22.30**	**22.97**	**23.45**	**23.79**	**24.05**	**24.25**	**24.44**	**24.60**	**24.71**	**24.81**	**24.88**	**24.94**	**24.99**	**25.04**	**25.07**	**25.10**	**25.12**	**25.14**	**25.16**	**25.17**	**25.19**
2009	0.09	0.91	2.62	**5.06**	**8.47**	**9.93**	**11.40**	**13.11**	**14.36**	**15.30**	**15.98**	**16.45**	**16.81**	**17.10**	**17.37**	**17.61**	**17.77**	**17.91**	**18.01**	**18.09**	**18.16**	**18.21**	**18.26**	**18.30**	**18.33**	**18.36**	**18.38**	**18.40**	**18.41**	**18.43**
2010	0.01	0.18	**1.02**	**2.80**	**3.89**	**5.57**	**7.82**	**9.58**	**10.93**	**11.89**	**12.56**	**13.06**	**13.44**	**13.79**	**14.13**	**14.37**	**14.55**	**14.69**	**14.80**	**14.88**	**14.96**	**15.01**	**15.06**	**15.11**	**15.14**	**15.17**	**15.19**	**15.21**	**15.23**	**15.24**
2011	0.00	**0.19**	**0.94**	**1.74**	**3.19**	**5.16**	**6.69**	**7.83**	**8.62**	**9.13**	**9.52**	**9.81**	**10.06**	**10.31**	**10.49**	**10.62**	**10.71**	**10.79**	**10.84**	**10.89**	**10.93**	**10.96**	**10.99**	**11.01**	**11.02**	**11.04**	**11.05**	**11.06**	**11.07**	**11.08**
2012	**0.01**	**0.25**	**0.84**	**2.36**	**4.58**	**6.33**	**7.65**	**8.54**	**9.12**	**9.55**	**9.85**	**10.10**	**10.35**	**10.54**	**10.68**	**10.77**	**10.85**	**10.90**	**10.95**	**10.98**	**11.01**	**11.04**	**11.06**	**11.07**	**11.09**	**11.10**	**11.11**	**11.12**	**11.13**	**11.14**
2013	**0.01**	**0.23**	**1.61**	**4.25**	**6.37**	**7.91**	**8.94**	**9.62**	**10.12**	**10.47**	**10.80**	**11.14**	**11.36**	**11.51**	**11.61**	**11.69**	**11.75**	**11.80**	**11.84**	**11.87**	**11.90**	**11.92**	**11.94**	**11.95**	**11.97**	**11.98**	**11.99**	**12.00**	**12.00**	**12.01**
2014	**0.01**	**0.49**	**2.45**	**4.79**	**6.57**	**7.78**	**8.59**	**9.20**	**9.72**	**10.19**	**10.52**	**10.72**	**10.87**	**10.98**	**11.06**	**11.12**	**11.17**	**11.21**	**11.25**	**11.27**	**11.30**	**11.32**	**11.34**	**11.35**	**11.36**	**11.37**	**11.38**	**11.39**	**11.39**	**11.40**
2015	**0.02**	**0.56**	**2.11**	**4.04**	**5.50**	**6.52**	**7.32**	**7.92**	**8.32**	**8.61**	**8.81**	**8.97**	**9.09**	**9.18**	**9.25**	**9.30**	**9.35**	**9.39**	**9.42**	**9.45**	**9.47**	**9.49**	**9.50**	**9.51**	**9.52**	**9.53**	**9.54**	**9.55**	**9.55**	**9.56**
2016	**0.02**	**0.48**	**1.95**	**3.64**	**4.92**	**5.89**	**6.68**	**7.30**	**7.73**	**8.01**	**8.22**	**8.37**	**8.48**	**8.57**	**8.64**	**8.70**	**8.74**	**8.78**	**8.81**	**8.83**	**8.85**	**8.87**	**8.88**	**8.89**	**8.90**	**8.91**	**8.92**	**8.93**	**8.93**	**8.94**
2017	**0.02**	**0.51**	**1.89**	**3.44**	**4.74**	**5.92**	**6.84**	**7.46**	**7.87**	**8.18**	**8.40**	**8.56**	**8.68**	**8.78**	**8.85**	**8.91**	**8.96**	**9.00**	**9.03**	**9.05**	**9.08**	**9.09**	**9.11**	**9.12**	**9.13**	**9.14**	**9.15**	**9.16**	**9.16**	**9.17**
2018	**0.02**	**0.52**	**1.85**	**3.52**	**5.06**	**6.20**	**7.01**	**7.59**	**8.03**	**8.34**	**8.56**	**8.73**	**8.86**	**8.97**	**9.05**	**9.11**	**9.16**	**9.21**	**9.24**	**9.27**	**9.30**	**9.32**	**9.34**	**9.35**	**9.36**	**9.37**	**9.38**	**9.39**	**9.40**	**9.40**
2019	**0.02**	**0.54**	**2.10**	**3.96**	**5.34**	**6.39**	**7.20**	**7.83**	**8.27**	**8.57**	**8.80**	**8.98**	**9.11**	**9.22**	**9.30**	**9.36**	**9.42**	**9.47**	**9.51**	**9.54**	**9.56**	**9.59**	**9.60**	**9.62**	**9.64**	**9.65**	**9.66**	**9.66**	**9.67**	**9.67**

Cumulative Prepayment Rates Adjustable Rate Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1991	0.22	2.21	8.67	16.68	22.46	31.13	38.61	48.27	56.70	61.28	67.97	73.86	78.44	81.22	82.89	84.68	85.59	86.07	86.45	86.63	86.79	**86.94**	**86.99**	**87.02**	**87.05**	**87.10**	**87.14**	**87.19**	**87.22**	**87.26**
1992	0.22	3.37	9.97	16.29	27.10	35.43	47.39	56.81	61.58	68.31	74.11	79.01	81.89	83.64	85.05	86.04	86.65	86.95	87.19	87.37	**87.55**	**87.61**	**87.65**	**87.68**	**87.74**	**87.79**	**87.84**	**87.89**	**87.93**	**87.97**
1993	0.44	3.86	8.97	20.65	29.15	42.32	52.95	58.13	66.75	73.68	79.16	82.35	84.27	85.56	86.56	87.09	87.37	87.58	87.73	**87.86**	**87.92**	**87.95**	**87.99**	**88.04**	**88.10**	**88.15**	**88.20**	**88.24**	**88.28**	**88.31**
1994	0.30	2.78	12.42	22.30	38.37	50.01	55.69	65.17	72.53	78.64	82.18	84.29	85.74	86.73	87.29	87.51	87.70	87.84	**87.99**	**88.06**	**88.10**	**88.14**	**88.20**	**88.26**	**88.32**	**88.37**	**88.42**	**88.46**	**88.50**	**88.53**
1995	1.71	11.76	25.56	48.40	59.40	64.07	71.40	76.91	81.16	83.93	85.68	86.87	87.63	87.99	88.15	88.26	88.33	**88.42**	**88.48**	**88.51**	**88.54**	**88.59**	**88.64**	**88.68**	**88.71**	**88.75**	**88.78**	**88.81**	**88.83**	**88.85**
1996	0.49	6.53	38.39	57.73	63.76	73.03	78.64	82.60	85.27	86.91	88.03	88.80	89.17	89.33	89.43	89.49	**89.58**	**89.64**	**89.66**	**89.70**	**89.74**	**89.79**	**89.83**	**89.86**	**89.90**	**89.93**	**89.95**	**89.97**	**89.99**	**90.01**
1997	0.93	19.22	46.91	56.45	71.20	77.78	82.36	85.28	87.16	88.49	89.38	89.84	90.02	90.13	90.21	**90.30**	**90.36**	**90.40**	**90.44**	**90.50**	**90.55**	**90.60**	**90.65**	**90.69**	**90.73**	**90.76**	**90.79**	**90.81**	**90.83**	**90.84**
1998	2.84	22.94	36.15	58.93	69.69	76.79	81.49	84.53	86.59	88.05	88.74	89.04	89.19	89.31	**89.43**	**89.53**	**89.57**	**89.63**	**89.71**	**89.79**	**89.86**	**89.92**	**89.98**	**90.03**	**90.08**	**90.11**	**90.14**	**90.17**	**90.19**	**90.21**
1999	0.39	4.37	35.48	55.40	68.31	75.59	81.17	84.99	87.68	88.91	89.33	89.56	89.70	**89.89**	**90.02**	**90.09**	**90.18**	**90.30**	**90.42**	**90.52**	**90.62**	**90.71**	**90.78**	**90.85**	**90.90**	**90.94**	**90.98**	**91.01**	**91.04**	**91.07**
2000	1.07	33.92	54.34	67.29	74.66	80.44	84.42	87.28	88.60	89.01	89.26	89.38	**89.59**	**89.73**	**89.80**	**89.89**	**90.01**	**90.13**	**90.24**	**90.34**	**90.43**	**90.51**	**90.58**	**90.63**	**90.68**	**90.72**	**90.75**	**90.78**	**90.81**	**90.83**
2001	4.99	24.17	46.71	60.34	72.23	79.95	85.08	87.11	87.86	88.25	88.48	**88.77**	**88.95**	**89.04**	**89.17**	**89.35**	**89.51**	**89.67**	**89.82**	**89.95**	**90.07**	**90.18**	**90.25**	**90.32**	**90.39**	**90.44**	**90.48**	**90.52**	**90.55**	**90.58**
2002	2.35	29.42	46.38	62.77	73.97	81.63	84.56	85.36	85.82	86.04	**86.31**	**86.52**	**86.63**	**86.79**	**87.00**	**87.22**	**87.42**	**87.61**	**87.79**	**87.94**	**88.08**	**88.18**	**88.27**	**88.35**	**88.42**	**88.48**	**88.53**	**88.57**	**88.61**	**88.64**
2003	8.09	28.68	52.92	69.12	79.02	82.62	83.55	84.01	84.33	**84.65**	**84.89**	**85.01**	**85.19**	**85.44**	**85.70**	**85.94**	**86.18**	**86.39**	**86.57**	**86.73**	**86.84**	**86.95**	**87.05**	**87.13**	**87.20**	**87.26**	**87.31**	**87.36**	**87.39**	**87.43**
2004	6.65	34.65	57.06	71.25	76.31	77.72	78.40	78.72	**79.19**	**79.53**	**79.71**	**79.98**	**80.38**	**80.80**	**81.19**	**81.56**	**81.90**	**82.20**	**82.46**	**82.64**	**82.81**	**82.97**	**83.09**	**83.20**	**83.29**	**83.38**	**83.45**	**83.51**	**83.56**	**83.61**
2005	9.33	29.45	47.45	57.04	59.71	60.89	61.42	**62.11**	**62.63**	**62.90**	**63.35**	**64.03**	**64.75**	**65.41**	**66.07**	**66.69**	**67.23**	**67.69**	**68.04**	**68.37**	**68.65**	**68.89**	**69.09**	**69.27**	**69.43**	**69.56**	**69.68**	**69.78**	**69.87**	**69.93**
2006	2.41	14.92	29.96	39.63	42.48	43.49	**44.42**	**45.04**	**45.37**	**45.95**	**46.84**	**47.79**	**48.68**	**49.61**	**50.48**	**51.30**	**52.02**	**52.55**	**53.03**	**53.46**	**53.82**	**54.15**	**54.43**	**54.67**	**54.88**	**55.06**	**55.22**	**55.36**	**55.46**	**55.56**
2007	1.60	13.10	29.79	37.60	39.84	**41.58**	**42.17**	**42.49**	**43.04**	**44.01**	**45.05**	**45.95**	**46.85**	**47.76**	**48.57**	**49.30**	**49.84**	**50.32**	**50.76**	**51.13**	**51.46**	**51.75**	**52.01**	**52.23**	**52.41**	**52.58**	**52.72**	**52.83**	**52.93**	**53.04**
2008	0.57	25.76	40.37	47.77	**50.96**	**51.67**	**52.06**	**52.81**	**54.06**	**55.43**	**56.69**	**57.99**	**59.21**	**60.26**	**61.16**	**61.83**	**62.44**	**62.97**	**63.41**	**63.78**	**64.11**	**64.41**	**64.66**	**64.87**	**65.06**	**65.23**	**65.36**	**65.48**	**65.61**	**65.72**
2009	12.84	30.28	41.88	**47.96**	**50.19**	**51.30**	**53.21**	**56.08**	**58.96**	**61.41**	**63.75**	**65.74**	**67.30**	**68.57**	**69.48**	**70.26**	**70.94**	**71.51**	**71.98**	**72.39**	**72.74**	**73.03**	**73.28**	**73.50**	**73.70**	**73.83**	**73.97**	**74.10**	**74.22**	**74.31**
2010	2.32	10.25	**20.25**	**26.93**	**30.12**	**35.25**	**42.44**	**49.29**	**54.82**	**59.73**	**63.62**	**66.54**	**68.77**	**70.28**	**71.56**	**72.65**	**73.55**	**74.28**	**74.92**	**75.44**	**75.88**	**76.24**	**76.58**	**76.86**	**77.06**	**77.25**	**77.42**	**77.58**	**77.70**	**77.83**
2011	1.55	**17.82**	**30.44**	**35.84**	**43.42**	**52.63**	**60.48**	**66.31**	**71.08**	**74.51**	**76.95**	**78.71**	**79.88**	**80.82**	**81.63**	**82.29**	**82.83**	**83.30**	**83.67**	**83.98**	**84.23**	**84.48**	**84.67**	**84.81**	**84.94**	**85.06**	**85.16**	**85.24**	**85.33**	**85.40**
2012	**4.40**	**19.13**	**26.58**	**37.86**	**50.38**	**60.11**	**66.89**	**72.14**	**75.77**	**78.24**	**79.98**	**81.09**	**81.97**	**82.73**	**83.33**	**83.82**	**84.25**	**84.57**	**84.85**	**85.08**	**85.30**	**85.46**	**85.58**	**85.69**	**85.79**	**85.88**	**85.96**	**86.03**	**86.10**	**86.15**
2013	**3.83**	**14.74**	**31.82**	**48.36**	**59.56**	**66.65**	**71.96**	**75.58**	**78.06**	**79.77**	**80.86**	**81.75**	**82.47**	**83.05**	**83.51**	**83.90**	**84.20**	**84.46**	**84.67**	**84.87**	**85.03**	**85.14**	**85.24**	**85.34**	**85.42**	**85.49**	**85.55**	**85.60**	**85.65**	**85.70**
2014	**3.45**	**25.91**	**48.14**	**61.40**	**68.95**	**74.05**	**77.46**	**79.84**	**81.44**	**82.44**	**83.25**	**83.92**	**84.46**	**84.88**	**85.23**	**85.49**	**85.71**	**85.89**	**86.06**	**86.20**	**86.29**	**86.38**	**86.46**	**86.52**	**86.58**	**86.63**	**86.67**	**86.71**	**86.74**	**86.77**
2015	**4.11**	**31.09**	**53.16**	**65.87**	**73.37**	**78.05**	**81.11**	**83.08**	**84.29**	**85.24**	**85.97**	**86.57**	**87.02**	**87.39**	**87.67**	**87.89**	**88.08**	**88.27**	**88.42**	**88.52**	**88.61**	**88.70**	**88.76**	**88.81**	**88.86**	**88.90**	**88.94**	**88.97**	**89.00**	**89.02**
2016	**4.70**	**30.73**	**54.22**	**67.71**	**75.21**	**79.54**	**82.22**	**83.87**	**85.11**	**86.05**	**86.86**	**87.42**	**87.87**	**88.21**	**88.49**	**88.72**	**88.92**	**89.09**	**89.21**	**89.31**	**89.40**	**89.47**	**89.53**	**89.58**	**89.63**	**89.67**	**89.71**	**89.73**	**89.76**	**89.78**
2017	**4.70**	**32.58**	**55.85**	**68.64**	**75.03**	**78.95**	**81.46**	**83.16**	**84.46**	**85.54**	**86.30**	**86.91**	**87.39**	**87.79**	**88.10**	**88.38**	**88.58**	**88.73**	**88.86**	**88.97**	**89.05**	**89.11**	**89.19**	**89.25**	**89.31**	**89.35**	**89.38**	**89.41**	**89.43**	**89.46**
2018	**4.56**	**33.10**	**55.61**	**67.52**	**74.18**	**78.16**	**80.67**	**82.53**	**84.00**	**85.04**	**85.85**	**86.45**	**86.94**	**87.32**	**87.65**	**87.89**	**88.07**	**88.23**	**88.37**	**88.48**	**88.56**	**88.64**	**88.73**	**88.80**	**88.85**	**88.89**	**88.93**	**88.96**	**88.99**	**89.02**
2019	**5.30**	**32.32**	**55.65**	**67.87**	**73.92**	**77.65**	**80.44**	**82.44**	**83.83**	**84.92**	**85.66**	**86.25**	**86.72**	**87.14**	**87.43**	**87.64**	**87.84**	**88.02**	**88.15**	**88.24**	**88.34**	**88.43**	**88.50**	**88.56**	**88.61**	**88.65**	**88.69**	**88.72**	**88.76**	**88.78**

Conditional Claim Rates Adjustable Rate Streamline Refinance Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1994	0.01	0.55	2.21	3.74	3.38	3.05	1.84	0.89	0.62	0.31	0.25	0.09	0.07	0.00	0.06	0.11	0.45	0.33	**0.35**	**0.82**	**0.42**	**0.53**	**0.56**	**0.39**	**0.29**	**0.24**	**0.19**	**0.18**	**0.16**	**0.11**
1995	0.00	0.60	2.29	2.59	3.91	3.87	1.25	0.98	1.79	0.46	0.32	1.54	0.79	0.53	0.68	0.49	0.68	**0.58**	**1.18**	**0.67**	**1.10**	**1.07**	**0.76**	**0.55**	**0.45**	**0.33**	**0.32**	**0.28**	**0.21**	**0.17**
1996	0.01	0.44	2.25	4.06	3.13	1.45	1.69	0.66	0.99	1.16	0.82	0.71	0.54	0.26	1.33	0.39	**1.05**	**2.03**	**1.09**	**1.29**	**1.43**	**0.97**	**0.71**	**0.59**	**0.46**	**0.44**	**0.37**	**0.30**	**0.26**	**0.19**
1997	0.01	0.42	2.19	3.78	2.90	2.45	2.20	1.25	0.77	0.36	0.77	1.12	0.97	1.29	0.90	**2.73**	**4.45**	**1.65**	**1.69**	**1.74**	**1.16**	**0.84**	**0.70**	**0.52**	**0.52**	**0.50**	**0.38**	**0.33**	**0.25**	**0.20**
1998	0.01	0.34	1.24	1.40	1.61	1.82	1.71	1.31	0.64	0.00	0.56	0.34	1.10	0.64	**2.36**	**3.54**	**1.85**	**2.01**	**1.92**	**1.31**	**0.96**	**0.79**	**0.60**	**0.59**	**0.53**	**0.41**	**0.35**	**0.29**	**0.24**	**0.17**
1999	0.00	0.14	0.48	0.93	2.40	1.69	1.26	0.54	0.83	0.56	1.11	0.71	2.18	**2.95**	**6.82**	**2.58**	**2.36**	**2.29**	**1.51**	**1.10**	**0.90**	**0.70**	**0.70**	**0.68**	**0.52**	**0.44**	**0.36**	**0.30**	**0.25**	**0.18**
2000	0.00	0.39	1.82	4.22	2.67	2.94	1.99	1.75	2.41	1.24	4.37	1.99	**3.33**	**5.94**	**2.70**	**3.03**	**3.11**	**2.04**	**1.53**	**1.21**	**0.96**	**1.00**	**0.99**	**0.71**	**0.58**	**0.46**	**0.39**	**0.32**	**0.25**	**0.17**
2001	0.03	0.19	1.92	2.90	2.07	1.83	1.79	2.94	5.96	4.53	4.02	**4.84**	**8.82**	**4.52**	**4.49**	**4.43**	**2.83**	**2.06**	**1.60**	**1.18**	**1.11**	**0.95**	**0.75**	**0.65**	**0.53**	**0.46**	**0.38**	**0.29**	**0.24**	**0.19**
2002	0.01	0.40	1.79	2.10	2.49	2.97	4.85	4.79	5.18	3.59	**7.03**	**9.27**	**4.25**	**4.69**	**4.32**	**2.76**	**2.02**	**1.58**	**1.22**	**1.11**	**1.01**	**0.79**	**0.69**	**0.56**	**0.49**	**0.41**	**0.33**	**0.28**	**0.23**	**0.17**
2003	0.02	0.81	2.19	2.84	3.27	5.72	5.44	5.63	4.84	**7.75**	**10.13**	**4.70**	**5.25**	**4.94**	**3.20**	**2.42**	**1.92**	**1.48**	**1.38**	**1.23**	**0.93**	**0.80**	**0.65**	**0.56**	**0.48**	**0.38**	**0.32**	**0.27**	**0.21**	**0.16**
2004	0.13	1.26	2.81	3.65	6.20	6.62	5.88	3.87	**8.14**	**10.93**	**4.99**	**5.59**	**5.17**	**3.36**	**2.52**	**1.99**	**1.55**	**1.44**	**1.32**	**1.00**	**0.86**	**0.69**	**0.61**	**0.51**	**0.41**	**0.35**	**0.30**	**0.24**	**0.20**	**0.14**
2005	0.26	2.04	4.06	5.40	6.76	5.59	4.70	**7.96**	**11.69**	**5.97**	**6.83**	**6.52**	**4.30**	**3.25**	**2.54**	**1.93**	**1.77**	**1.63**	**1.26**	**1.06**	**0.86**	**0.76**	**0.64**	**0.51**	**0.43**	**0.38**	**0.31**	**0.27**	**0.21**	**0.14**
2006	0.00	2.49	6.58	7.25	11.84	3.67	**8.70**	**12.28**	**6.27**	**7.55**	**7.19**	**4.84**	**3.62**	**2.80**	**2.13**	**1.99**	**1.96**	**1.46**	**1.16**	**0.90**	**0.77**	**0.65**	**0.54**	**0.43**	**0.37**	**0.30**	**0.25**	**0.21**	**0.17**	**0.12**
2007	0.00	2.34	4.05	11.85	8.38	**9.14**	**21.40**	**10.76**	**10.70**	**9.26**	**5.36**	**3.95**	**2.98**	**2.34**	**2.48**	**2.12**	**1.48**	**1.23**	**0.95**	**0.76**	**0.64**	**0.51**	**0.42**	**0.40**	**0.33**	**0.27**	**0.21**	**0.18**	**0.14**	**0.10**
2008	0.00	1.06	6.86	10.02	**14.66**	**27.71**	**13.64**	**10.09**	**7.78**	**4.62**	**3.09**	**2.19**	**1.65**	**1.52**	**1.43**	**1.00**	**0.82**	**0.64**	**0.54**	**0.46**	**0.37**	**0.30**	**0.25**	**0.21**	**0.18**	**0.15**	**0.12**	**0.11**	**0.08**	**0.07**
2009	0.04	0.80	3.26	**10.57**	**15.64**	**6.90**	**6.00**	**4.49**	**2.52**	**1.77**	**1.32**	**0.99**	**0.91**	**0.86**	**0.63**	**0.52**	**0.41**	**0.35**	**0.29**	**0.23**	**0.19**	**0.17**	**0.13**	**0.12**	**0.10**	**0.08**	**0.07**	**0.06**	**0.05**	**0.04**
2010	0.12	1.40	**6.16**	**10.57**	**4.88**	**5.24**	**4.26**	**2.56**	**1.86**	**1.42**	**1.08**	**1.02**	**0.96**	**0.70**	**0.56**	**0.45**	**0.39**	**0.33**	**0.26**	**0.22**	**0.19**	**0.15**	**0.14**	**0.11**	**0.09**	**0.08**	**0.07**	**0.06**	**0.04**	**0.03**
2011	0.03	**0.95**	**4.01**	**3.58**	**5.11**	**4.86**	**3.25**	**2.50**	**1.96**	**1.53**	**1.50**	**1.54**	**1.12**	**0.87**	**0.69**	**0.60**	**0.50**	**0.39**	**0.33**	**0.29**	**0.23**	**0.21**	**0.17**	**0.14**	**0.13**	**0.10**	**0.09**	**0.07**	**0.06**	**0.04**
2012	**0.06**	**0.83**	**2.62**	**5.54**	**6.03**	**4.43**	**3.64**	**2.95**	**2.36**	**2.31**	**2.47**	**1.89**	**1.46**	**1.14**	**1.00**	**0.83**	**0.65**	**0.54**	**0.47**	**0.38**	**0.35**	**0.28**	**0.24**	**0.22**	**0.18**	**0.16**	**0.13**	**0.11**	**0.09**	**0.06**
2013	**0.03**	**0.73**	**4.42**	**6.58**	**5.22**	**4.51**	**3.87**	**3.23**	**3.26**	**3.37**	**2.54**	**2.01**	**1.60**	**1.40**	**1.16**	**0.91**	**0.76**	**0.67**	**0.54**	**0.49**	**0.39**	**0.33**	**0.31**	**0.25**	**0.22**	**0.18**	**0.16**	**0.12**	**0.10**	**0.08**
2014	**0.03**	**1.01**	**4.54**	**5.20**	**4.76**	**4.54**	**4.62**	**6.46**	**6.31**	**3.61**	**2.46**	**1.88**	**1.63**	**1.36**	**1.08**	**0.94**	**0.78**	**0.60**	**0.55**	**0.43**	**0.37**	**0.35**	**0.28**	**0.23**	**0.20**	**0.18**	**0.15**	**0.12**	**0.11**	**0.08**
2015	**0.04**	**0.97**	**3.15**	**4.19**	**3.95**	**3.65**	**3.79**	**3.35**	**2.86**	**2.33**	**1.98**	**1.94**	**1.63**	**1.28**	**1.04**	**0.89**	**0.73**	**0.69**	**0.54**	**0.45**	**0.42**	**0.34**	**0.29**	**0.25**	**0.22**	**0.18**	**0.15**	**0.13**	**0.10**	**0.08**
2016	**0.04**	**0.64**	**2.49**	**3.46**	**3.37**	**3.69**	**3.71**	**2.96**	**2.62**	**2.24**	**2.09**	**1.71**	**1.37**	**1.22**	**1.08**	**0.89**	**0.76**	**0.61**	**0.51**	**0.49**	**0.40**	**0.33**	**0.28**	**0.24**	**0.21**	**0.17**	**0.15**	**0.12**	**0.11**	**0.07**
2017	**0.03**	**0.61**	**2.44**	**3.62**	**5.64**	**6.48**	**4.23**	**3.27**	**2.67**	**2.53**	**1.98**	**1.60**	**1.31**	**1.18**	**0.97**	**0.83**	**0.67**	**0.60**	**0.55**	**0.43**	**0.37**	**0.31**	**0.28**	**0.23**	**0.19**	**0.17**	**0.15**	**0.13**	**0.09**	**0.07**
2018	**0.03**	**0.65**	**2.27**	**3.80**	**4.60**	**3.99**	**4.00**	**3.61**	**3.58**	**2.73**	**2.20**	**1.89**	**1.70**	**1.38**	**1.24**	**0.92**	**0.88**	**0.77**	**0.59**	**0.58**	**0.48**	**0.41**	**0.36**	**0.27**	**0.24**	**0.20**	**0.18**	**0.13**	**0.11**	**0.08**
2019	**0.03**	**0.61**	**2.42**	**3.59**	**3.63**	**3.82**	**3.81**	**3.80**	**3.13**	**2.53**	**2.20**	**2.01**	**1.62**	**1.48**	**1.18**	**1.08**	**0.98**	**0.76**	**0.75**	**0.64**	**0.57**	**0.52**	**0.38**	**0.32**	**0.26**	**0.22**	**0.16**	**0.13**	**0.11**	**0.08**

Conditional Prepayment Rates Adjustable Rate Streamline Refinance Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1994	2.66	6.34	10.75	9.81	15.61	16.12	12.38	20.55	22.83	28.68	23.34	19.56	17.74	15.89	10.54	8.92	4.66	3.78	**4.00**	**2.51**	**1.78**	**2.12**	**2.43**	**2.34**	**2.17**	**2.09**	**1.95**	**1.72**	**1.40**	**0.94**
1995	2.25	18.79	21.06	27.62	18.12	13.60	23.58	27.15	24.42	24.58	20.30	15.95	14.40	9.60	4.73	5.00	2.71	**2.43**	**3.02**	**2.21**	**2.64**	**2.82**	**2.81**	**2.45**	**2.31**	**2.14**	**1.88**	**1.59**	**1.26**	**0.92**
1996	3.13	22.57	42.04	34.18	15.39	29.26	28.57	30.62	26.75	24.41	21.69	15.63	14.75	6.64	4.51	4.71	**3.91**	**3.20**	**2.30**	**2.67**	**3.14**	**3.01**	**2.87**	**2.79**	**2.60**	**2.29**	**1.92**	**1.47**	**1.26**	**1.01**
1997	4.79	40.69	43.35	20.14	35.17	29.37	34.18	31.06	28.59	25.55	22.06	11.76	5.64	3.75	4.21	**3.28**	**3.30**	**2.56**	**2.99**	**3.38**	**3.34**	**3.11**	**3.11**	**2.90**	**2.49**	**2.07**	**1.70**	**1.49**	**1.31**	**1.06**
1998	10.69	42.35	23.03	41.33	35.60	37.33	30.89	29.87	25.51	23.66	15.49	7.58	3.77	3.52	**5.64**	**4.03**	**3.07**	**3.63**	**4.13**	**4.12**	**3.80**	**3.70**	**3.42**	**3.06**	**2.70**	**2.11**	**1.88**	**1.64**	**1.44**	**1.06**
1999	3.41	10.88	34.24	31.55	33.06	28.54	29.23	28.89	26.05	16.89	9.39	6.92	1.88	**4.35**	**4.26**	**3.43**	**4.20**	**4.82**	**4.68**	**4.39**	**4.04**	**3.87**	**3.52**	**3.10**	**2.61**	**2.36**	**2.13**	**1.87**	**1.52**	**1.17**
2000	2.64	23.06	22.00	19.83	23.50	24.86	27.87	27.47	13.96	3.22	3.69	1.68	**3.44**	**4.21**	**3.25**	**3.86**	**4.33**	**4.32**	**3.99**	**3.79**	**3.64**	**3.26**	**2.89**	**2.38**	**2.12**	**1.91**	**1.75**	**1.53**	**1.27**	**0.92**
2001	3.57	33.08	30.59	27.57	33.52	31.98	29.61	16.20	5.83	3.02	1.37	**4.85**	**3.74**	**3.03**	**3.72**	**4.37**	**4.44**	**4.36**	**4.39**	**4.29**	**3.88**	**3.40**	**2.89**	**2.63**	**2.36**	**2.06**	**1.85**	**1.65**	**1.35**	**1.06**
2002	6.25	35.80	27.90	31.41	32.29	31.96	19.08	7.37	3.51	2.46	**3.10**	**3.68**	**3.03**	**3.91**	**4.83**	**5.02**	**4.94**	**4.95**	**4.79**	**4.41**	**3.87**	**3.23**	**2.99**	**2.69**	**2.41**	**2.11**	**1.89**	**1.66**	**1.41**	**1.09**
2003	15.88	29.76	34.12	34.20	34.11	22.26	7.87	4.97	2.44	**3.58**	**3.54**	**2.95**	**3.92**	**4.94**	**5.26**	**5.23**	**5.28**	**5.26**	**4.85**	**4.30**	**3.60**	**3.31**	**3.02**	**2.76**	**2.45**	**2.15**	**1.91**	**1.68**	**1.41**	**1.08**
2004	12.23	31.44	31.21	30.43	18.90	6.58	4.02	2.07	**3.30**	**3.60**	**3.07**	**4.19**	**5.42**	**5.90**	**5.91**	**6.01**	**5.90**	**5.47**	**4.87**	**4.11**	**3.77**	**3.45**	**3.15**	**2.83**	**2.53**	**2.25**	**1.99**	**1.70**	**1.43**	**1.04**
2005	15.08	25.17	23.60	18.33	5.46	2.90	1.51	**3.59**	**4.43**	**3.65**	**4.90**	**6.36**	**6.96**	**7.02**	**7.26**	**7.27**	**6.76**	**6.04**	**5.13**	**4.80**	**4.39**	**4.05**	**3.62**	**3.29**	**2.96**	**2.64**	**2.32**	**2.06**	**1.74**	**1.22**
2006	6.86	16.67	17.55	11.48	4.00	1.03	**2.95**	**3.92**	**3.15**	**4.38**	**6.00**	**7.06**	**7.18**	**7.34**	**7.50**	**7.04**	**6.45**	**5.67**	**5.13**	**4.91**	**4.39**	**4.25**	**3.87**	**3.47**	**3.08**	**2.66**	**2.47**	**2.24**	**1.77**	**1.34**
2007	7.09	19.43	20.91	9.35	3.98	**5.02**	**2.76**	**2.51**	**4.16**	**6.64**	**7.92**	**7.73**	**8.54**	**7.81**	**6.83**	**5.92**	**5.31**	**5.41**	**5.12**	**4.60**	**4.25**	**4.16**	**3.53**	**2.94**	**2.78**	**2.83**	**2.35**	**1.97**	**1.79**	**1.42**
2008	3.34	29.70	9.24	5.09	**3.79**	**1.61**	**1.73**	**3.09**	**4.72**	**5.65**	**6.09**	**6.56**	**6.77**	**6.52**	**6.16**	**5.33**	**5.10**	**4.74**	**4.33**	**3.98**	**3.72**	**3.38**	**3.02**	**2.72**	**2.41**	**2.13**	**1.84**	**1.73**	**1.60**	**1.28**
2009	2.58	11.28	8.87	**4.25**	**2.01**	**1.89**	**3.41**	**5.51**	**6.94**	**7.50**	**8.24**	**8.49**	**8.13**	**7.37**	**6.33**	**5.97**	**5.63**	**5.27**	**4.79**	**4.55**	**4.10**	**3.73**	**3.37**	**3.17**	**2.83**	**2.43**	**2.31**	**2.25**	**2.00**	**1.63**
2010	4.22	11.33	**5.36**	**2.87**	**2.53**	**4.51**	**7.10**	**8.69**	**9.17**	**9.86**	**10.09**	**9.51**	**8.52**	**7.25**	**6.76**	**6.31**	**5.91**	**5.43**	**5.05**	**4.61**	**4.25**	**3.89**	**3.68**	**3.29**	**2.82**	**2.70**	**2.60**	**2.31**	**1.97**	**1.61**
2011	0.84	**9.89**	**6.49**	**4.48**	**7.53**	**11.45**	**13.55**	**13.96**	**14.63**	**14.47**	**13.27**	**11.77**	**10.02**	**9.34**	**8.77**	**8.22**	**7.50**	**6.96**	**6.37**	**5.91**	**5.37**	**5.12**	**4.51**	**3.83**	**3.63**	**3.52**	**3.12**	**2.72**	**2.47**	**1.91**
2012	**2.82**	**9.89**	**6.88**	**10.63**	**15.38**	**17.64**	**17.76**	**18.21**	**17.39**	**15.62**	**13.74**	**11.57**	**10.73**	**10.02**	**9.26**	**8.39**	**7.82**	**7.17**	**6.73**	**6.15**	**5.86**	**5.07**	**4.32**	**4.08**	**3.98**	**3.58**	**3.14**	**2.93**	**2.51**	**2.06**
2013	**5.37**	**13.64**	**17.51**	**19.78**	**20.86**	**19.90**	**19.96**	**18.90**	**16.83**	**14.63**	**12.14**	**11.22**	**10.41**	**9.45**	**8.45**	**7.77**	**6.98**	**6.52**	**6.01**	**5.71**	**4.93**	**4.18**	**3.93**	**3.79**	**3.42**	**3.02**	**2.82**	**2.46**	**2.22**	**1.74**
2014	**8.61**	**29.36**	**30.67**	**25.90**	**23.47**	**21.33**	**19.82**	**17.41**	**14.70**	**12.66**	**11.88**	**10.73**	**9.46**	**8.02**	**7.19**	**6.66**	**6.33**	**5.79**	**5.64**	**5.18**	**4.22**	**3.79**	**3.74**	**3.30**	**2.89**	**2.58**	**2.20**	**2.17**	**1.94**	**1.54**
2015	**11.69**	**37.70**	**37.00**	**30.50**	**26.96**	**23.91**	**20.89**	**17.92**	**14.72**	**12.92**	**11.43**	**10.43**	**9.18**	**8.47**	**7.81**	**7.02**	**6.17**	**5.70**	**5.12**	**4.25**	**3.99**	**3.97**	**3.46**	**2.99**	**3.01**	**2.56**	**2.34**	**2.14**	**1.95**	**1.54**
2016	**13.35**	**38.29**	**41.00**	**34.25**	**30.51**	**25.82**	**21.93**	**16.97**	**15.02**	**13.27**	**12.59**	**10.52**	**9.20**	**8.47**	**7.82**	**7.06**	**6.27**	**5.52**	**4.68**	**4.51**	**4.53**	**3.87**	**3.24**	**3.28**	**2.88**	**2.67**	**2.33**	**2.16**	**1.95**	**1.64**
2017	**13.70**	**39.65**	**41.33**	**32.74**	**26.37**	**22.61**	**18.76**	**16.45**	**14.92**	**15.40**	**12.86**	**11.70**	**10.89**	**10.30**	**8.82**	**7.57**	**6.16**	**5.40**	**4.98**	**4.76**	**4.25**	**3.67**	**3.56**	**3.21**	**2.82**	**2.45**	**2.39**	**2.29**	**2.07**	**1.71**
2018	**13.28**	**38.66**	**38.22**	**28.46**	**24.89**	**21.64**	**18.06**	**16.77**	**15.82**	**14.75**	**13.37**	**11.64**	**10.72**	**9.39**	**8.98**	**6.78**	**6.28**	**5.70**	**5.01**	**4.41**	**3.88**	**3.93**	**3.94**	**3.33**	**2.72**	**2.48**	**2.52**	**2.26**	**1.88**	**1.74**
2019	**13.73**	**36.03**	**38.17**	**30.51**	**24.15**	**21.42**	**20.97**	**18.58**	**16.71**	**14.65**	**12.44**	**11.23**	**9.67**	**9.05**	**7.28**	**6.50**	**6.08**	**5.56**	**4.69**	**3.94**	**3.83**	**3.72**	**3.26**	**2.88**	**2.78**	**2.77**	**2.49**	**2.13**	**2.08**	**1.63**

Cumulative Claim Rates Adjustable Rate Streamline Refinance Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1994	0.01	0.55	2.55	5.51	7.81	9.50	10.32	10.66	10.84	10.92	10.96	10.97	10.97	10.97	10.98	10.98	11.01	11.03	**11.04**	**11.08**	**11.10**	**11.13**	**11.15**	**11.17**	**11.18**	**11.19**	**11.20**	**11.21**	**11.21**	**11.22**
1995	0.00	0.59	2.40	3.96	5.61	6.88	7.22	7.41	7.68	7.73	7.75	7.85	7.89	7.91	7.94	7.96	7.98	**8.00**	**8.04**	**8.06**	**8.10**	**8.13**	**8.15**	**8.17**	**8.18**	**8.19**	**8.20**	**8.20**	**8.21**	**8.21**
1996	0.01	0.44	2.12	3.81	4.61	4.91	5.15	5.22	5.29	5.34	5.37	5.39	5.41	5.41	5.44	5.44	**5.46**	**5.49**	**5.51**	**5.53**	**5.55**	**5.56**	**5.57**	**5.58**	**5.58**	**5.59**	**5.59**	**5.60**	**5.60**	**5.60**
1997	0.01	0.41	1.64	2.80	3.47	3.82	4.03	4.11	4.14	4.15	4.17	4.19	4.20	4.22	4.23	**4.27**	**4.32**	**4.34**	**4.35**	**4.37**	**4.38**	**4.39**	**4.39**	**4.40**	**4.40**	**4.41**	**4.41**	**4.41**	**4.41**	**4.41**
1998	0.01	0.31	0.95	1.49	1.84	2.10	2.24	2.31	2.34	2.34	2.35	2.36	2.37	2.38	**2.42**	**2.47**	**2.50**	**2.52**	**2.54**	**2.56**	**2.57**	**2.58**	**2.58**	**2.59**	**2.59**	**2.59**	**2.60**	**2.60**	**2.60**	**2.60**
1999	0.00	0.14	0.55	1.07	1.98	2.40	2.61	2.67	2.74	2.78	2.83	2.86	2.95	**3.07**	**3.32**	**3.40**	**3.48**	**3.54**	**3.58**	**3.61**	**3.63**	**3.64**	**3.66**	**3.67**	**3.68**	**3.69**	**3.70**	**3.70**	**3.71**	**3.71**
2000	0.00	0.38	1.74	4.15	5.31	6.24	6.70	6.98	7.25	7.36	7.76	7.92	**8.19**	**8.64**	**8.82**	**9.01**	**9.19**	**9.30**	**9.38**	**9.44**	**9.48**	**9.52**	**9.56**	**9.59**	**9.61**	**9.63**	**9.64**	**9.66**	**9.67**	**9.67**
2001	0.03	0.22	1.46	2.72	3.35	3.70	3.93	4.19	4.61	4.89	5.12	**5.39**	**5.82**	**6.01**	**6.19**	**6.35**	**6.45**	**6.51**	**6.55**	**6.59**	**6.61**	**6.64**	**6.65**	**6.67**	**6.68**	**6.69**	**6.70**	**6.70**	**6.71**	**6.71**
2002	0.01	0.38	1.45	2.33	3.03	3.56	4.13	4.56	4.97	5.23	**5.70**	**6.26**	**6.49**	**6.71**	**6.91**	**7.02**	**7.09**	**7.15**	**7.19**	**7.22**	**7.25**	**7.27**	**7.29**	**7.30**	**7.31**	**7.32**	**7.33**	**7.34**	**7.34**	**7.35**
2003	0.02	0.70	1.98	3.03	3.79	4.63	5.20	5.71	6.10	**6.68**	**7.36**	**7.63**	**7.90**	**8.14**	**8.28**	**8.37**	**8.44**	**8.49**	**8.54**	**8.57**	**8.60**	**8.62**	**8.63**	**8.65**	**8.66**	**8.67**	**8.68**	**8.68**	**8.69**	**8.69**
2004	0.13	1.24	2.90	4.31	5.89	7.15	8.13	8.71	**9.86**	**11.21**	**11.75**	**12.29**	**12.75**	**13.01**	**13.19**	**13.32**	**13.41**	**13.49**	**13.56**	**13.60**	**13.64**	**13.67**	**13.70**	**13.72**	**13.74**	**13.75**	**13.76**	**13.77**	**13.78**	**13.79**
2005	0.26	2.00	4.50	6.90	9.20	10.87	12.15	**14.19**	**16.84**	**17.97**	**19.14**	**20.12**	**20.68**	**21.06**	**21.32**	**21.50**	**21.65**	**21.78**	**21.87**	**21.94**	**21.99**	**22.04**	**22.07**	**22.10**	**22.12**	**22.14**	**22.16**	**22.17**	**22.19**	**22.19**
2006	0.00	2.34	7.30	11.46	16.98	18.41	**21.67**	**25.71**	**27.44**	**29.33**	**30.91**	**31.83**	**32.44**	**32.85**	**33.14**	**33.38**	**33.59**	**33.73**	**33.84**	**33.92**	**33.98**	**34.03**	**34.07**	**34.10**	**34.13**	**34.15**	**34.17**	**34.18**	**34.19**	**34.20**
2007	0.00	2.20	5.16	11.65	15.28	**18.75**	**25.66**	**28.29**	**30.55**	**32.22**	**33.03**	**33.54**	**33.89**	**34.13**	**34.35**	**34.52**	**34.63**	**34.72**	**34.78**	**34.83**	**34.87**	**34.90**	**34.92**	**34.94**	**34.96**	**34.97**	**34.98**	**34.99**	**35.00**	**35.00**
2008	0.00	1.03	5.65	11.32	**18.36**	**29.14**	**32.88**	**35.22**	**36.77**	**37.58**	**38.07**	**38.38**	**38.60**	**38.78**	**38.93**	**39.03**	**39.11**	**39.16**	**39.21**	**39.25**	**39.28**	**39.30**	**39.32**	**39.33**	**39.34**	**39.35**	**39.36**	**39.37**	**39.37**	**39.38**
2009	0.04	0.83	3.64	**11.67**	**21.74**	**25.39**	**28.29**	**30.25**	**31.23**	**31.86**	**32.28**	**32.57**	**32.81**	**33.01**	**33.15**	**33.25**	**33.33**	**33.39**	**33.44**	**33.48**	**33.51**	**33.53**	**33.55**	**33.57**	**33.58**	**33.59**	**33.60**	**33.61**	**33.62**	**33.62**
2010	0.12	1.47	**6.67**	**14.53**	**17.66**	**20.78**	**23.06**	**24.27**	**25.05**	**25.58**	**25.94**	**26.24**	**26.49**	**26.65**	**26.77**	**26.86**	**26.94**	**27.00**	**27.04**	**27.07**	**27.10**	**27.13**	**27.15**	**27.16**	**27.17**	**27.18**	**27.19**	**27.20**	**27.21**	**27.21**
2011	0.04	**0.99**	**4.56**	**7.41**	**11.14**	**14.24**	**15.97**	**17.07**	**17.79**	**18.26**	**18.64**	**18.98**	**19.19**	**19.33**	**19.44**	**19.52**	**19.58**	**19.63**	**19.66**	**19.69**	**19.71**	**19.73**	**19.75**	**19.76**	**19.77**	**19.78**	**19.78**	**19.79**	**19.79**	**19.80**
2012	**0.06**	**0.87**	**3.16**	**7.53**	**11.51**	**13.80**	**15.26**	**16.19**	**16.78**	**17.24**	**17.64**	**17.89**	**18.06**	**18.18**	**18.27**	**18.34**	**18.39**	**18.43**	**18.46**	**18.48**	**18.50**	**18.51**	**18.53**	**18.54**	**18.54**	**18.55**	**18.56**	**18.56**	**18.56**	**18.57**
2013	**0.03**	**0.73**	**4.33**	**8.50**	**10.92**	**12.47**	**13.47**	**14.11**	**14.60**	**15.01**	**15.26**	**15.43**	**15.55**	**15.64**	**15.71**	**15.76**	**15.79**	**15.82**	**15.85**	**15.87**	**15.88**	**15.89**	**15.90**	**15.91**	**15.92**	**15.92**	**15.93**	**15.93**	**15.93**	**15.94**
2014	**0.03**	**0.96**	**3.85**	**5.99**	**7.33**	**8.24**	**8.93**	**9.65**	**10.17**	**10.41**	**10.55**	**10.64**	**10.71**	**10.76**	**10.80**	**10.83**	**10.85**	**10.87**	**10.88**	**10.89**	**10.90**	**10.91**	**10.92**	**10.92**	**10.93**	**10.93**	**10.93**	**10.93**	**10.94**	**10.94**
2015	**0.04**	**0.90**	**2.60**	**3.95**	**4.78**	**5.30**	**5.70**	**5.96**	**6.14**	**6.25**	**6.34**	**6.41**	**6.47**	**6.50**	**6.53**	**6.55**	**6.57**	**6.58**	**6.59**	**6.60**	**6.61**	**6.61**	**6.62**	**6.62**	**6.63**	**6.63**	**6.63**	**6.63**	**6.63**	**6.64**
2016	**0.04**	**0.59**	**1.90**	**2.93**	**3.55**	**4.00**	**4.31**	**4.50**	**4.63**	**4.72**	**4.80**	**4.85**	**4.88**	**4.91**	**4.94**	**4.95**	**4.97**	**4.98**	**4.98**	**4.99**	**5.00**	**5.00**	**5.00**	**5.01**	**5.01**	**5.01**	**5.01**	**5.02**	**5.02**	**5.02**
2017	**0.03**	**0.56**	**1.82**	**2.85**	**3.87**	**4.65**	**5.02**	**5.24**	**5.38**	**5.49**	**5.56**	**5.61**	**5.65**	**5.68**	**5.70**	**5.71**	**5.72**	**5.73**	**5.74**	**5.75**	**5.75**	**5.76**	**5.76**	**5.76**	**5.76**	**5.77**	**5.77**	**5.77**	**5.77**	**5.77**
2018	**0.03**	**0.60**	**1.79**	**2.96**	**3.92**	**4.51**	**4.94**	**5.25**	**5.49**	**5.64**	**5.74**	**5.81**	**5.86**	**5.90**	**5.93**	**5.95**	**5.97**	**5.99**	**6.00**	**6.01**	**6.02**	**6.02**	**6.03**	**6.03**	**6.04**	**6.04**	**6.04**	**6.04**	**6.05**	**6.05**
2019	**0.03**	**0.56**	**1.88**	**3.03**	**3.80**	**4.38**	**4.81**	**5.13**	**5.34**	**5.47**	**5.57**	**5.64**	**5.70**	**5.74**	**5.77**	**5.79**	**5.81**	**5.83**	**5.84**	**5.86**	**5.87**	**5.87**	**5.88**	**5.88**	**5.89**	**5.89**	**5.89**	**5.90**	**5.90**	**5.90**

Cumulative Prepayment Rates Adjustable Rate Streamline Refinance Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1994	2.68	8.88	18.66	26.42	37.10	46.03	51.57	59.44	66.32	72.92	76.73	79.17	80.94	82.25	83.00	83.57	83.83	84.03	**84.23**	**84.35**	**84.44**	**84.54**	**84.65**	**84.75**	**84.84**	**84.93**	**85.01**	**85.08**	**85.14**	**85.19**
1995	2.25	20.68	37.30	53.99	61.64	66.11	72.51	78.04	81.62	84.28	85.93	86.94	87.69	88.13	88.32	88.53	88.63	**88.71**	**88.82**	**88.89**	**88.97**	**89.06**	**89.14**	**89.21**	**89.27**	**89.33**	**89.38**	**89.42**	**89.46**	**89.49**
1996	3.14	25.10	56.51	70.70	74.64	80.74	84.86	87.94	89.79	91.00	91.80	92.25	92.60	92.73	92.82	92.91	**92.97**	**93.02**	**93.06**	**93.10**	**93.14**	**93.18**	**93.22**	**93.26**	**93.29**	**93.32**	**93.34**	**93.36**	**93.37**	**93.39**
1997	4.82	43.72	67.99	74.13	82.27	86.48	89.82	91.74	92.94	93.69	94.17	94.37	94.45	94.50	94.56	**94.60**	**94.64**	**94.66**	**94.69**	**94.73**	**94.76**	**94.79**	**94.81**	**94.84**	**94.86**	**94.87**	**94.89**	**94.90**	**94.91**	**94.92**
1998	10.74	48.67	60.47	76.48	84.35	89.54	92.14	93.83	94.82	95.50	95.84	95.98	96.04	96.10	**96.19**	**96.24**	**96.28**	**96.33**	**96.38**	**96.42**	**96.46**	**96.50**	**96.53**	**96.56**	**96.58**	**96.60**	**96.62**	**96.63**	**96.65**	**96.66**
1999	3.43	13.99	43.54	61.25	73.79	80.75	85.72	89.11	91.26	92.28	92.75	93.06	93.14	**93.31**	**93.47**	**93.58**	**93.71**	**93.85**	**93.97**	**94.08**	**94.18**	**94.27**	**94.34**	**94.41**	**94.46**	**94.51**	**94.55**	**94.58**	**94.61**	**94.64**
2000	2.65	25.20	41.62	52.92	63.08	71.00	77.38	81.78	83.36	83.67	84.00	84.14	**84.42**	**84.74**	**84.97**	**85.21**	**85.47**	**85.70**	**85.91**	**86.09**	**86.26**	**86.40**	**86.52**	**86.62**	**86.70**	**86.78**	**86.85**	**86.90**	**86.96**	**87.00**
2001	3.58	35.61	55.35	67.34	77.45	83.62	87.39	88.80	89.21	89.40	89.48	**89.75**	**89.93**	**90.06**	**90.22**	**90.38**	**90.53**	**90.66**	**90.79**	**90.90**	**91.00**	**91.09**	**91.15**	**91.21**	**91.27**	**91.31**	**91.35**	**91.38**	**91.41**	**91.44**
2002	6.29	40.03	56.77	69.98	78.97	84.76	86.99	87.65	87.93	88.11	**88.32**	**88.54**	**88.70**	**88.89**	**89.11**	**89.31**	**89.50**	**89.67**	**89.83**	**89.96**	**90.07**	**90.16**	**90.24**	**90.31**	**90.37**	**90.42**	**90.47**	**90.51**	**90.54**	**90.57**
2003	15.99	41.15	61.12	73.81	81.74	84.97	85.80	86.25	86.45	**86.72**	**86.96**	**87.13**	**87.34**	**87.58**	**87.81**	**88.02**	**88.22**	**88.39**	**88.55**	**88.68**	**88.78**	**88.87**	**88.94**	**89.01**	**89.07**	**89.12**	**89.17**	**89.21**	**89.24**	**89.27**
2004	12.41	40.09	58.49	70.30	75.11	76.37	77.04	77.35	**77.82**	**78.27**	**78.60**	**79.01**	**79.49**	**79.96**	**80.38**	**80.77**	**81.13**	**81.43**	**81.68**	**81.88**	**82.06**	**82.21**	**82.34**	**82.46**	**82.56**	**82.65**	**82.73**	**82.80**	**82.85**	**82.90**
2005	15.31	36.68	51.23	59.37	61.22	62.08	62.49	**63.42**	**64.42**	**65.12**	**65.96**	**66.92**	**67.84**	**68.66**	**69.42**	**70.10**	**70.68**	**71.15**	**71.52**	**71.85**	**72.13**	**72.37**	**72.58**	**72.76**	**72.92**	**73.06**	**73.18**	**73.29**	**73.38**	**73.45**
2006	6.91	22.49	35.73	42.29	44.14	44.55	**45.66**	**46.95**	**47.82**	**48.92**	**50.24**	**51.59**	**52.80**	**53.90**	**54.91**	**55.76**	**56.48**	**57.05**	**57.53**	**57.97**	**58.34**	**58.67**	**58.96**	**59.22**	**59.43**	**59.61**	**59.78**	**59.93**	**60.05**	**60.17**
2007	7.14	25.30	40.54	45.64	47.36	**49.25**	**50.15**	**50.76**	**51.65**	**52.85**	**54.05**	**55.06**	**56.05**	**56.85**	**57.48**	**57.98**	**58.39**	**58.78**	**59.12**	**59.41**	**59.67**	**59.90**	**60.10**	**60.25**	**60.39**	**60.53**	**60.64**	**60.74**	**60.83**	**60.91**
2008	3.36	32.20	38.39	41.25	**43.06**	**43.69**	**44.16**	**44.88**	**45.83**	**46.82**	**47.79**	**48.73**	**49.61**	**50.39**	**51.07**	**51.61**	**52.10**	**52.53**	**52.90**	**53.22**	**53.51**	**53.76**	**53.98**	**54.16**	**54.33**	**54.47**	**54.59**	**54.71**	**54.82**	**54.91**
2009	2.59	13.65	21.26	**24.47**	**25.76**	**26.77**	**28.42**	**30.83**	**33.56**	**36.23**	**38.89**	**41.37**	**43.52**	**45.28**	**46.68**	**47.91**	**48.99**	**49.94**	**50.75**	**51.49**	**52.12**	**52.68**	**53.16**	**53.59**	**53.97**	**54.29**	**54.59**	**54.87**	**55.14**	**55.37**
2010	4.27	15.15	**19.64**	**21.77**	**23.40**	**26.08**	**29.89**	**34.01**	**37.87**	**41.56**	**44.91**	**47.71**	**49.95**	**51.68**	**53.17**	**54.46**	**55.58**	**56.54**	**57.39**	**58.13**	**58.77**	**59.33**	**59.84**	**60.28**	**60.65**	**61.00**	**61.33**	**61.62**	**61.88**	**62.12**
2011	0.85	**10.71**	**16.48**	**20.05**	**25.56**	**32.87**	**40.10**	**46.29**	**51.70**	**56.16**	**59.59**	**62.18**	**64.09**	**65.68**	**67.01**	**68.15**	**69.09**	**69.89**	**70.57**	**71.16**	**71.66**	**72.11**	**72.49**	**72.80**	**73.08**	**73.35**	**73.58**	**73.78**	**73.96**	**74.13**
2012	**2.85**	**12.51**	**18.51**	**26.91**	**37.07**	**46.21**	**53.36**	**59.12**	**63.45**	**66.57**	**68.82**	**70.41**	**71.68**	**72.73**	**73.58**	**74.28**	**74.86**	**75.36**	**75.78**	**76.15**	**76.47**	**76.73**	**76.94**	**77.13**	**77.31**	**77.47**	**77.60**	**77.73**	**77.83**	**77.93**
2013	**5.40**	**18.34**	**32.58**	**45.13**	**54.86**	**61.72**	**66.90**	**70.64**	**73.23**	**75.03**	**76.25**	**77.21**	**77.99**	**78.61**	**79.10**	**79.51**	**79.84**	**80.13**	**80.38**	**80.59**	**80.77**	**80.91**	**81.04**	**81.16**	**81.26**	**81.35**	**81.43**	**81.50**	**81.57**	**81.63**
2014	**8.65**	**35.60**	**55.15**	**65.82**	**72.48**	**76.82**	**79.81**	**81.79**	**83.07**	**83.93**	**84.61**	**85.14**	**85.54**	**85.84**	**86.09**	**86.30**	**86.48**	**86.64**	**86.78**	**86.90**	**87.00**	**87.08**	**87.16**	**87.22**	**87.28**	**87.32**	**87.37**	**87.41**	**87.44**	**87.48**
2015	**11.75**	**45.18**	**65.22**	**75.09**	**80.78**	**84.26**	**86.45**	**87.87**	**88.78**	**89.44**	**89.94**	**90.33**	**90.63**	**90.87**	**91.08**	**91.25**	**91.38**	**91.50**	**91.60**	**91.68**	**91.75**	**91.81**	**91.87**	**91.91**	**91.96**	**91.99**	**92.03**	**92.06**	**92.09**	**92.11**
2016	**13.42**	**46.77**	**68.46**	**78.66**	**84.31**	**87.46**	**89.34**	**90.42**	**91.18**	**91.74**	**92.18**	**92.50**	**92.74**	**92.94**	**93.11**	**93.25**	**93.36**	**93.45**	**93.52**	**93.59**	**93.65**	**93.71**	**93.75**	**93.79**	**93.83**	**93.86**	**93.89**	**93.91**	**93.93**	**93.96**
2017	**13.78**	**48.18**	**69.47**	**78.92**	**83.76**	**86.58**	**88.23**	**89.34**	**90.16**	**90.84**	**91.32**	**91.68**	**91.97**	**92.22**	**92.40**	**92.54**	**92.65**	**92.74**	**92.81**	**92.88**	**92.94**	**92.99**	**93.03**	**93.07**	**93.10**	**93.13**	**93.16**	**93.19**	**93.21**	**93.24**
2018	**13.36**	**47.05**	**67.15**	**76.04**	**81.29**	**84.50**	**86.50**	**87.94**	**89.02**	**89.83**	**90.43**	**90.87**	**91.22**	**91.49**	**91.72**	**91.87**	**92.00**	**92.12**	**92.21**	**92.29**	**92.35**	**92.42**	**92.48**	**92.53**	**92.56**	**92.60**	**92.64**	**92.67**	**92.69**	**92.72**
2019	**13.81**	**45.06**	**65.92**	**75.80**	**80.93**	**84.23**	**86.64**	**88.24**	**89.35**	**90.13**	**90.68**	**91.10**	**91.41**	**91.66**	**91.85**	**92.00**	**92.14**	**92.25**	**92.34**	**92.41**	**92.48**	**92.54**	**92.59**	**92.63**	**92.68**	**92.72**	**92.75**	**92.78**	**92.82**	**92.84**

Loss Rates **All Mortgages** **by Credit Subsidy Endorsement Cohort**

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1983	36.54	48.44	46.85	47.46	49.95	50.33	48.28	46.81	47.52	47.81	45.76	46.21	47.43	50.69	55.24	54.25	55.31	60.51	63.09	57.02	63.45	61.03	87.58	105.77	135.74	170.18	152.90	259.00	267.04	**114.34**
1984	46.96	48.27	48.66	50.09	51.43	50.94	50.27	50.20	52.24	51.61	52.63	52.36	58.35	70.09	68.22	66.91	66.33	60.66	82.76	56.14	70.02	58.85	130.67	151.07	165.84	208.68	208.36	182.71	**135.43**	**122.36**
1985	45.41	49.15	50.58	50.25	49.25	48.83	49.41	48.60	47.93	49.20	49.24	50.29	56.60	57.34	68.81	55.13	57.99	69.27	58.05	66.32	63.86	104.48	102.96	126.51	140.05	182.53	82.43	**103.69**	**125.22**	**128.43**
1986	45.87	51.02	50.01	47.85	46.43	45.15	44.94	43.03	42.23	41.44	40.94	41.31	42.60	43.98	41.65	43.75	48.23	48.60	48.92	65.03	63.40	72.94	118.52	100.31	90.25	100.58	**77.80**	**121.01**	**126.81**	**111.49**
1987	47.72	48.61	46.03	45.28	45.26	44.35	42.93	41.71	40.97	40.96	40.90	41.57	44.59	43.13	42.32	47.05	50.02	49.82	55.85	71.29	87.98	101.48	105.97	110.49	102.45	**74.23**	**118.90**	**118.15**	**112.61**	**111.40**
1988	44.88	44.82	44.48	44.34	44.71	44.46	44.65	45.32	45.12	44.99	47.24	48.88	47.76	48.10	50.49	46.68	53.49	61.74	66.48	95.50	108.00	108.99	104.51	98.71	**77.76**	**119.69**	**116.91**	**113.96**	**113.69**	**112.50**
1989	53.47	47.25	44.13	45.24	45.54	45.95	47.05	47.20	47.39	49.13	50.96	49.07	47.35	46.67	48.77	53.68	61.28	77.17	101.27	130.46	108.87	107.84	98.77	**78.90**	**119.47**	**118.27**	**117.00**	**118.11**	**117.76**	**114.50**
1990	45.75	44.92	44.18	45.18	46.98	47.90	49.48	50.38	51.64	51.89	50.42	48.93	52.44	52.59	52.92	57.42	70.82	94.80	116.74	98.97	105.12	107.93	**83.53**	**116.64**	**117.79**	**117.32**	**119.66**	**120.40**	**117.94**	**115.55**
1991	47.12	43.25	43.88	45.99	47.84	48.97	51.56	52.12	51.68	46.98	47.83	44.03	44.58	47.85	60.61	78.39	93.69	115.35	102.74	93.33	97.15	**83.99**	**114.69**	**116.48**	**114.99**	**117.88**	**119.43**	**117.77**	**115.89**	**114.56**
1992	46.10	43.27	43.24	43.94	45.16	47.35	47.85	47.59	43.95	40.05	36.79	33.21	42.82	47.38	61.70	81.45	99.68	87.43	82.97	86.90	**78.14**	**106.35**	**106.88**	**109.21**	**112.40**	**114.76**	**114.58**	**113.93**	**114.02**	**113.75**
1993	37.34	40.07	41.42	41.38	44.06	44.06	41.94	38.67	33.90	31.75	33.70	38.85	43.30	58.86	72.11	87.05	84.75	72.40	75.50	**76.87**	**101.56**	**102.73**	**104.85**	**108.88**	**111.99**	**112.57**	**112.85**	**113.61**	**113.78**	**113.86**
1994	36.81	40.64	41.33	41.79	42.11	40.01	36.69	31.80	30.75	32.67	34.92	46.46	53.07	69.47	90.57	74.14	74.92	76.78	**77.56**	**98.00**	**100.27**	**100.52**	**105.06**	**108.92**	**110.39**	**111.50**	**113.11**	**114.22**	**114.92**	**114.43**
1995	42.30	40.33	40.09	40.65	40.54	39.24	35.22	34.15	37.40	38.17	43.18	50.05	78.69	83.31	81.20	78.33	73.22	**75.67**	**93.73**	**93.80**	**97.03**	**102.69**	**107.49**	**109.61**	**111.02**	**113.03**	**114.42**	**115.28**	**114.53**	**112.68**
1996	31.60	38.17	38.14	37.50	36.06	33.69	31.85	34.93	36.10	41.15	52.42	65.72	79.28	83.77	72.22	79.02	**72.82**	**88.63**	**88.89**	**91.61**	**97.31**	**102.48**	**105.29**	**107.58**	**110.20**	**112.35**	**114.64**	**115.49**	**114.64**	**114.63**
1997	25.75	36.88	35.48	34.53	32.80	32.19	34.18	37.63	40.83	49.84	65.65	80.92	79.53	78.12	74.51	**70.16**	**85.21**	**84.56**	**87.17**	**93.09**	**98.66**	**101.92**	**104.49**	**107.31**	**109.97**	**112.80**	**113.94**	**113.25**	**113.61**	**112.59**
1998	28.40	35.12	31.67	30.45	30.38	32.47	34.57	37.61	47.04	63.81	75.89	78.17	70.16	70.98	**70.60**	**81.72**	**80.39**	**81.88**	**87.70**	**93.27**	**96.74**	**99.79**	**103.42**	**106.79**	**110.41**	**113.09**	**113.43**	**114.29**	**114.05**	**114.06**
1999	28.05	31.18	29.64	29.26	31.27	33.69	37.22	44.02	60.69	72.65	73.52	66.65	70.97	**68.41**	**78.65**	**76.08**	**77.23**	**82.78**	**88.35**	**92.02**	**95.34**	**99.45**	**103.41**	**107.76**	**111.57**	**113.09**	**114.86**	**115.25**	**115.56**	**114.80**
2000	25.78	30.33	30.02	34.15	36.29	39.71	47.75	60.40	76.16	77.51	73.06	75.50	**69.42**	**78.98**	**75.64**	**76.87**	**81.82**	**87.23**	**90.75**	**93.94**	**97.87**	**102.05**	**106.62**	**110.28**	**111.93**	**114.63**	**115.95**	**117.03**	**116.62**	**116.70**
2001	28.20	29.75	34.02	36.57	38.84	45.67	58.58	70.61	73.47	69.38	72.30	**69.50**	**77.03**	**73.35**	**73.58**	**77.76**	**82.44**	**85.67**	**88.68**	**92.98**	**97.69**	**102.88**	**107.94**	**110.72**	**113.90**	**115.91**	**117.85**	**118.47**	**119.00**	**118.21**
2002	24.88	32.49	36.34	38.21	43.02	53.43	64.71	68.14	65.22	66.03	**67.36**	**74.56**	**69.47**	**69.44**	**73.04**	**77.26**	**80.24**	**83.10**	**87.23**	**91.97**	**97.40**	**102.49**	**105.39**	**109.05**	**111.78**	**114.38**	**115.49**	**116.77**	**116.77**	**115.98**
2003	29.56	37.83	37.26	41.03	50.16	60.24	63.70	60.42	61.33	**65.85**	**72.68**	**66.21**	**65.04**	**68.27**	**72.03**	**74.80**	**77.37**	**81.38**	**86.21**	**91.88**	**97.34**	**100.62**	**104.67**	**107.88**	**111.04**	**112.78**	**114.66**	**115.31**	**115.06**	**114.28**
2004	38.40	37.59	39.19	48.13	57.64	61.94	58.73	61.07	**65.13**	**71.67**	**65.21**	**62.27**	**64.78**	**68.26**	**70.81**	**73.05**	**76.67**	**81.34**	**87.05**	**92.57**	**96.05**	**100.36**	**103.97**	**107.52**	**109.64**	**112.03**	**113.17**	**113.37**	**112.85**	**112.35**
2005	38.78	38.57	47.70	58.38	62.48	59.92	61.77	**63.63**	**71.71**	**65.71**	**61.87**	**62.24**	**64.74**	**67.08**	**68.53**	**71.20**	**75.14**	**80.71**	**86.27**	**89.66**	**94.40**	**98.80**	**103.14**	**106.03**	**109.56**	**111.84**	**113.02**	**113.24**	**113.39**	**112.95**
2006	38.05	44.25	56.26	61.80	60.47	63.22	**63.00**	**73.32**	**68.75**	**64.77**	**64.46**	**64.97**	**66.08**	**67.03**	**68.96**	**71.98**	**76.91**	**82.18**	**85.61**	**90.58**	**95.28**	**100.12**	**103.85**	**108.18**	**111.53**	**113.80**	**115.13**	**116.13**	**116.16**	**115.67**
2007	33.43	52.51	60.03	58.93	62.50	**62.04**	**72.98**	**69.47**	**66.45**	**66.04**	**66.20**	**65.78**	**65.68**	**67.25**	**69.98**	**74.51**	**79.33**	**82.40**	**87.30**	**92.05**	**97.16**	**101.25**	**106.13**	**110.20**	**113.11**	**115.24**	**117.18**	**118.05**	**118.13**	**117.04**
2008	41.61	53.34	51.87	56.15	**60.18**	**69.99**	**67.20**	**64.76**	**64.56**	**64.73**	**64.31**	**63.06**	**63.95**	**66.86**	**71.51**	**76.27**	**79.08**	**83.83**	**88.55**	**93.81**	**98.06**	**103.27**	**107.79**	**111.26**	**114.06**	**116.92**	**118.73**	**119.52**	**118.86**	**118.38**
2009	40.06	43.47	48.23	**55.97**	**64.34**	**61.60**	**59.70**	**58.80**	**58.26**	**57.69**	**56.72**	**56.79**	**59.24**	**64.15**	**69.08**	**71.81**	**76.68**	**81.51**	**87.03**	**91.42**	**96.90**	**101.75**	**105.65**	**109.09**	**112.63**	**115.33**	**116.76**	**116.68**	**116.99**	**117.01**
2010	34.47	43.04	**51.06**	**56.74**	**54.08**	**51.90**	**50.88**	**50.49**	**50.21**	**49.71**	**50.16**	**51.73**	**56.22**	**61.20**	**63.58**	**68.25**	**73.14**	**78.88**	**83.28**	**89.11**	**94.17**	**98.40**	**102.18**	**106.43**	**109.83**	**111.82**	**112.35**	**113.26**	**113.83**	**113.17**
2011	34.97	**46.74**	**50.08**	**48.93**	**47.13**	**46.32**	**46.08**	**45.96**	**45.83**	**46.67**	**48.59**	**51.97**	**56.04**	**58.26**	**62.57**	**67.37**	**73.23**	**77.64**	**83.76**	**89.05**	**93.54**	**97.78**	**102.93**	**107.37**	**110.14**	**111.49**	**113.43**	**114.96**	**115.12**	**114.85**
2012	**58.97**	**42.27**	**43.08**	**42.67**	**42.47**	**42.36**	**42.39**	**42.33**	**43.16**	**45.00**	**48.44**	**51.08**	**52.38**	**56.98**	**61.74**	**67.66**	**72.17**	**78.39**	**83.85**	**88.49**	**93.10**	**98.88**	**104.08**	**107.72**	**109.75**	**112.68**	**115.22**	**116.18**	**116.22**	**116.69**
2013	**38.49**	**39.26**	**41.32**	**42.97**	**43.56**	**43.05**	**42.65**	**43.81**	**45.98**	**49.16**	**51.39**	**51.66**	**55.04**	**59.77**	**65.24**	**69.67**	**75.76**	**81.29**	**86.04**	**90.96**	**97.41**	**103.42**	**107.98**	**111.26**	**115.12**	**118.59**	**120.36**	**121.08**	**121.62**	**122.56**
2014	**32.08**	**35.50**	**40.26**	**43.17**	**42.82**	**42.84**	**44.23**	**46.61**	**49.43**	**51.29**	**51.77**	**53.44**	**56.87**	**62.14**	**66.71**	**72.55**	**77.88**	**82.58**	**87.46**	**94.43**	**101.32**	**106.24**	**110.24**	**114.66**	**118.57**	**121.45**	**123.13**	**124.36**	**125.72**	**126.11**
2015	**30.07**	**34.15**	**38.76**	**40.20**	**40.93**	**42.15**	**43.72**	**46.66**	**49.14**	**49.84**	**51.50**	**53.50**	**57.70**	**61.84**	**67.59**	**72.83**	**77.07**	**82.07**	**89.19**	**96.06**	**101.28**	**105.60**	**110.71**	**115.38**	**118.93**	**121.63**	**123.58**	**125.56**	**126.89**	**127.66**
2016	**29.52**	**34.00**	**37.39**	**39.00**	**40.35**	**42.15**	**44.83**	**47.26**	**47.94**	**49.80**	**51.41**	**54.15**	**57.58**	**63.52**	**68.15**	**72.04**	**76.92**	**83.68**	**90.71**	**96.20**	**100.47**	**106.14**	**111.31**	**115.83**	**119.08**	**121.87**	**124.83**	**126.72**	**127.69**	**127.34**
2017	**30.68**	**33.49**	**37.07**	**39.24**	**41.69**	**44.12**	**45.62**	**46.14**	**47.70**	**49.16**	**51.50**	**53.49**	**58.68**	**63.17**	**66.92**	**71.93**	**78.72**	**85.42**	**91.01**	**95.43**	**101.65**	**107.26**	**111.87**	**115.58**	**119.11**	**122.94**	**125.22**	**126.15**	**126.33**	**126.19**
2018	**30.06**	**33.19**	**37.24**	**40.06**	**42.28**	**43.98**	**44.62**	**45.96**	**47.89**	**49.87**	**51.64**	**55.09**	**58.32**	**61.79**	**66.57**	**73.13**	**79.32**	**84.83**	**89.72**	**96.23**	**101.77**	**106.32**	**110.29**	**114.46**	**119.21**	**122.47**	**124.68**	**125.72**	**126.09**	**125.86**
2019	**29.86**	**33.98**	**38.41**	**41.40**	**43.36**	**43.97**	**45.23**	**46.96**	**48.57**	**50.09**	**53.11**	**54.98**	**57.52**	**61.98**	**68.16**	**74.05**	**79.43**	**84.20**	**90.87**	**96.57**	**101.18**	**105.44**	**109.78**	**114.79**	**118.82**	**121.61**	**123.48**	**125.07**	**125.65**	**126.27**

Loss Rates **Fixed Rate 30 Year Mortgages** **by Credit Subsidy Endorsement Cohort**

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1983	35.83	48.53	46.83	47.35	49.88	50.24	48.21	46.77	47.50	47.92	45.79	46.08	47.44	50.60	54.89	54.26	55.31	60.51	63.09	57.02	63.45	61.03	87.58	105.77	135.74	170.18	152.90	259.00	267.04	**114.34**
1984	47.19	48.32	48.73	50.01	51.22	50.90	50.21	50.02	52.20	51.56	52.43	52.24	57.69	70.02	67.73	66.33	66.33	60.66	82.76	56.14	70.02	58.85	130.67	151.07	165.84	208.68	208.36	182.71	**135.43**	**122.36**
1985	45.36	49.22	50.53	50.21	49.21	48.76	49.26	48.42	47.68	48.93	49.06	50.17	56.03	56.83	63.56	54.46	57.97	69.62	58.05	66.32	61.84	104.48	102.96	126.51	140.05	182.53	82.43	**103.69**	**125.24**	**128.46**
1986	45.88	51.15	50.06	47.84	46.40	45.10	44.86	42.96	42.22	41.28	40.80	41.16	42.44	43.74	41.21	43.82	48.16	48.47	48.80	65.03	63.40	72.94	118.52	100.31	90.87	100.58	**77.70**	**121.11**	**127.01**	**111.73**
1987	47.00	48.62	46.09	45.37	45.36	44.44	42.86	41.70	40.86	40.93	40.87	41.48	44.56	43.18	42.33	47.23	50.29	49.86	56.04	72.41	87.98	101.62	107.52	110.56	102.45	**74.85**	**119.15**	**118.67**	**113.55**	**112.76**
1988	46.00	44.96	44.59	44.64	44.54	44.20	44.47	44.93	45.03	44.51	47.13	49.02	48.04	48.57	50.74	46.28	53.51	62.11	65.85	98.11	108.33	108.21	107.25	99.06	**77.52**	**120.87**	**118.89**	**116.18**	**116.28**	**114.86**
1989	54.43	47.32	44.04	45.09	45.33	45.58	46.74	46.84	46.95	48.72	50.69	48.85	47.77	46.98	47.52	53.74	61.05	77.17	101.81	131.64	108.27	108.54	99.39	**78.64**	**119.42**	**118.41**	**117.69**	**119.16**	**118.93**	**115.62**
1990	46.12	45.17	44.01	45.06	46.87	47.83	49.41	50.14	51.19	52.07	50.17	49.17	52.37	52.52	53.12	57.35	71.21	95.40	116.74	98.96	106.12	109.46	**82.59**	**117.04**	**118.20**	**118.26**	**120.72**	**121.76**	**119.54**	**117.08**
1991	45.45	43.26	44.01	45.98	47.82	49.24	51.73	51.74	51.91	47.41	48.79	43.56	45.21	49.61	59.21	78.15	95.36	116.46	102.92	91.35	96.19	**85.28**	**115.12**	**117.11**	**116.18**	**119.55**	**121.49**	**120.19**	**118.05**	**116.32**
1992	48.15	42.63	43.59	44.09	46.04	47.93	48.46	49.21	44.73	40.89	39.31	33.37	44.02	50.74	64.39	84.32	102.04	86.49	80.09	86.62	**78.75**	**107.97**	**107.71**	**111.76**	**115.84**	**118.67**	**118.66**	**117.94**	**117.39**	**116.36**
1993	38.60	39.05	40.45	40.59	42.53	42.59	41.45	39.03	35.12	32.54	34.95	40.03	43.51	58.14	72.37	89.10	84.67	74.75	74.00	**72.45**	**101.57**	**103.97**	**106.39**	**111.07**	**114.64**	**115.35**	**115.32**	**115.21**	**114.29**	**113.18**
1994	42.88	40.02	39.55	39.67	40.91	40.63	37.85	33.73	32.52	33.32	36.08	47.74	56.73	70.00	88.49	75.17	75.32	79.58	**76.22**	**98.50**	**101.71**	**101.82**	**107.20**	**111.52**	**113.19**	**113.97**	**115.01**	**115.47**	**116.25**	**116.84**
1995	37.52	39.71	38.87	40.27	41.69	40.98	36.55	36.20	37.97	38.45	43.46	50.70	77.82	83.95	80.43	77.76	71.87	**76.20**	**94.34**	**95.01**	**98.17**	**104.38**	**109.66**	**111.95**	**113.33**	**115.16**	**116.21**	**117.42**	**117.70**	**116.12**
1996	35.76	36.33	37.66	39.06	37.28	35.06	33.44	35.76	36.18	42.12	53.13	65.51	79.88	84.00	75.25	78.35	**73.50**	**89.71**	**89.78**	**92.72**	**98.77**	**104.18**	**107.11**	**109.26**	**111.89**	**113.89**	**116.40**	**118.23**	**118.03**	**117.88**
1997	23.84	35.87	36.54	36.48	34.71	34.16	35.57	38.04	41.06	51.22	66.17	80.74	79.58	77.72	74.88	**70.60**	**86.04**	**85.86**	**88.54**	**94.84**	**100.61**	**104.01**	**106.45**	**109.41**	**112.06**	**115.15**	**117.78**	**118.06**	**118.05**	**116.61**
1998	27.97	35.84	33.23	31.61	31.36	32.92	34.81	38.44	46.97	65.15	77.72	79.07	70.15	70.34	**70.54**	**82.01**	**80.89**	**82.25**	**88.16**	**93.82**	**97.41**	**100.32**	**103.96**	**107.19**	**110.92**	**114.22**	**115.20**	**115.98**	**115.40**	**114.62**
1999	29.99	32.47	30.33	29.96	31.72	34.01	37.53	44.25	60.85	73.83	74.38	66.72	71.64	**68.49**	**78.93**	**76.35**	**77.51**	**83.09**	**88.68**	**92.40**	**95.51**	**99.63**	**103.55**	**107.87**	**111.93**	**113.74**	**115.50**	**115.74**	**115.84**	**114.98**
2000	26.82	30.51	30.25	34.36	36.47	40.14	48.67	61.63	77.71	79.60	74.70	76.50	**69.76**	**79.68**	**76.60**	**77.71**	**82.74**	**88.17**	**91.75**	**94.89**	**99.06**	**103.43**	**108.16**	**112.94**	**115.41**	**118.06**	**119.32**	**120.49**	**120.35**	**120.15**
2001	28.48	30.17	34.43	37.24	39.46	46.35	58.93	70.76	74.03	69.17	73.05	**68.77**	**76.87**	**73.62**	**73.82**	**78.02**	**82.76**	**86.05**	**88.94**	**93.23**	**97.95**	**103.08**	**108.19**	**110.97**	**114.07**	**116.02**	**117.86**	**118.33**	**118.68**	**117.55**
2002	28.72	33.26	37.15	39.39	44.33	54.46	65.16	69.03	65.13	65.41	**67.20**	**74.84**	**70.07**	**69.95**	**73.51**	**77.69**	**80.73**	**83.33**	**87.48**	**92.24**	**97.73**	**103.14**	**106.32**	**109.90**	**112.46**	**114.93**	**116.07**	**117.24**	**117.06**	**116.04**
2003	34.27	40.11	38.87	42.85	51.54	60.83	64.13	61.18	61.42	**65.33**	**73.33**	**67.28**	**65.65**	**68.64**	**72.22**	**75.04**	**77.34**	**81.27**	**86.07**	**91.77**	**97.32**	**100.57**	**104.50**	**107.48**	**110.37**	**111.87**	**113.62**	**113.83**	**113.31**	**112.18**
2004	40.59	39.11	40.56	49.00	58.36	62.08	58.96	61.63	**65.26**	**72.75**	**66.50**	**63.13**	**65.29**	**68.57**	**71.21**	**73.21**	**76.68**	**81.24**	**86.99**	**92.67**	**96.19**	**100.49**	**104.00**	**107.41**	**109.44**	**111.82**	**112.71**	**112.76**	**112.09**	**111.31**
2005	40.59	40.15	47.93	58.33	62.45	59.77	61.70	**64.03**	**72.36**	**66.53**	**62.49**	**62.57**	**64.88**	**67.36**	**68.73**	**71.30**	**75.10**	**80.63**	**86.34**	**90.06**	**94.92**	**99.22**	**103.47**	**106.45**	**109.91**	**112.04**	**113.18**	**113.43**	**113.19**	**112.35**
2006	41.22	44.35	55.96	61.66	60.29	63.12	**63.12**	**73.61**	**69.15**	**65.12**	**64.69**	**65.08**	**66.21**	**67.15**	**69.04**	**72.02**	**76.87**	**82.09**	**85.59**	**90.58**	**95.25**	**100.10**	**103.85**	**108.19**	**111.53**	**113.79**	**115.13**	**116.02**	**115.93**	**115.32**
2007	32.87	52.61	59.83	58.76	62.25	**62.11**	**72.95**	**69.52**	**66.54**	**66.12**	**66.24**	**65.83**	**65.70**	**67.24**	**69.93**	**74.42**	**79.21**	**82.33**	**87.24**	**91.99**	**97.08**	**101.18**	**106.03**	**110.08**	**112.98**	**115.07**	**116.94**	**117.70**	**117.65**	**116.44**
2008	42.20	53.04	51.47	55.60	**60.06**	**69.75**	**67.03**	**64.66**	**64.51**	**64.69**	**64.30**	**63.04**	**63.90**	**66.78**	**71.41**	**76.16**	**78.98**	**83.74**	**88.46**	**93.73**	**97.97**	**103.18**	**107.69**	**111.13**	**113.91**	**116.72**	**118.43**	**119.12**	**118.34**	**117.86**
2009	39.83	41.55	45.95	**53.66**	**61.23**	**58.44**	**56.67**	**56.47**	**56.61**	**56.48**	**55.70**	**55.84**	**58.36**	**63.34**	**68.31**	**71.05**	**75.93**	**80.72**	**86.23**	**90.59**	**96.04**	**100.82**	**104.68**	**108.00**	**111.37**	**113.81**	**114.99**	**114.67**	**114.84**	**114.40**
2010	29.24	36.54	**47.51**	**52.48**	**50.30**	**48.36**	**48.19**	**48.51**	**48.68**	**48.36**	**48.83**	**50.36**	**54.98**	**60.08**	**62.62**	**67.66**	**72.53**	**78.26**	**82.76**	**88.44**	**93.41**	**97.70**	**101.50**	**105.53**	**108.75**	**110.59**	**110.99**	**112.08**	**112.62**	**111.99**
2011	26.35	**43.13**	**45.10**	**44.45**	**42.55**	**42.43**	**42.95**	**43.42**	**43.54**	**44.40**	**46.13**	**49.60**	**54.04**	**56.43**	**61.47**	**66.36**	**72.27**	**76.88**	**82.80**	**88.03**	**92.66**	**96.93**	**101.92**	**106.31**	**109.07**	**110.38**	**112.64**	**114.32**	**114.51**	**114.25**
2012	**59.01**	**36.83**	**38.51**	**37.95**	**38.36**	**39.15**	**39.98**	**40.34**	**41.30**	**42.99**	**46.39**	**49.59**	**50.88**	**55.88**	**60.66**	**66.67**	**71.26**	**77.41**	**82.80**	**87.52**	**92.12**	**97.82**	**102.93**	**106.57**	**108.56**	**111.63**	**114.30**	**115.21**	**115.33**	**115.80**
2013	**30.26**	**32.40**	**35.33**	**37.98**	**39.64**	**40.38**	**40.54**	**41.90**	**44.00**	**47.20**	**50.03**	**50.47**	**53.97**	**58.70**	**64.26**	**68.76**	**74.75**	**80.22**	**84.99**	**89.93**	**96.40**	**102.32**	**106.91**	**110.25**	**114.18**	**117.89**	**119.53**	**120.14**	**120.62**	**121.29**
2014	**27.74**	**32.03**	**37.56**	**41.14**	**41.53**	**41.74**	**43.18**	**45.17**	**48.13**	**50.75**	**51.53**	**53.30**	**56.63**	**61.87**	**66.45**	**72.26**	**77.59**	**82.28**	**87.18**	**94.10**	**100.88**	**105.89**	**110.10**	**114.46**	**118.49**	**121.21**	**122.78**	**124.03**	**125.29**	**125.50**
2015	**27.07**	**31.93**	**37.20**	**39.19**	**40.20**	**41.56**	**43.23**	**46.29**	**48.93**	**49.67**	**51.32**	**53.26**	**57.51**	**61.73**	**67.48**	**72.67**	**76.90**	**81.88**	**88.98**	**95.82**	**101.10**	**105.43**	**110.46**	**115.16**	**118.73**	**121.29**	**122.97**	**124.88**	**126.06**	**126.18**
2016	**26.78**	**31.85**	**35.80**	**37.77**	**39.50**	**41.54**	**44.40**	**47.04**	**47.74**	**49.60**	**51.21**	**53.99**	**57.40**	**63.28**	**67.95**	**71.87**	**76.71**	**83.42**	**90.36**	**95.97**	**100.24**	**105.81**	**110.95**	**115.49**	**118.64**	**121.09**	**123.88**	**125.57**	**125.96**	**125.31**
2017	**27.65**	**31.26**	**35.00**	**37.59**	**39.94**	**42.71**	**45.07**	**45.87**	**47.58**	**49.21**	**51.63**	**53.61**	**58.72**	**63.28**	**66.97**	**71.88**	**78.61**	**85.30**	**90.94**	**95.38**	**101.54**	**107.18**	**111.77**	**115.50**	**118.88**	**122.56**	**124.82**	**125.52**	**125.48**	**125.09**
2018	**26.94**	**30.53**	**35.01**	**38.16**	**40.94**	**43.28**	**44.04**	**45.53**	**47.58**	**49.82**	**51.62**	**55.08**	**58.41**	**61.90**	**66.58**	**73.00**	**79.20**	**84.68**	**89.43**	**95.95**	**101.54**	**106.25**	**110.37**	**114.36**	**118.90**	**121.97**	**123.74**	**124.48**	**124.75**	**124.68**
2019	**27.28**	**31.47**	**36.10**	**39.83**	**42.42**	**43.25**	**44.72**	**46.64**	**48.45**	**49.98**	**53.08**	**55.04**	**57.56**	**61.97**	**68.05**	**73.92**	**79.21**	**83.88**	**90.53**	**96.16**	**100.82**	**105.25**	**109.67**	**114.68**	**118.65**	**121.31**	**122.88**	**124.08**	**124.49**	**124.59**

Loss Rates **Fixed Rate 30 Year Streamline Refinance Mortgages** **by Credit Subsidy Endorsement Cohort**

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1992	30.50	46.49	38.86	41.24	42.22	43.50	44.17	43.45	46.20	33.69	30.22	43.29	49.66	41.22	67.23	52.81	97.31	93.79	167.29	110.42	**75.64**	**107.62**	**107.00**	**109.83**	**114.01**	**117.08**	**117.65**	**117.90**	**118.61**	**118.83**
1993	33.35	40.72	42.24	43.20	47.04	47.15	43.34	37.76	32.91	30.58	34.90	39.19	38.94	62.28	63.75	75.26	96.10	54.24	76.57	**91.81**	**102.90**	**102.59**	**104.87**	**109.29**	**112.68**	**113.41**	**114.29**	**115.47**	**116.13**	**116.68**
1994	34.66	41.29	43.41	45.08	45.60	42.13	37.50	29.79	29.16	31.56	29.83	40.41	40.17	69.42	81.97	73.18	73.17	56.10	**80.69**	**98.84**	**99.59**	**101.67**	**106.44**	**110.43**	**111.84**	**113.25**	**115.02**	**116.39**	**117.69**	**118.75**
1995	35.51	44.55	43.74	42.34	44.27	34.51	32.79	28.29	38.42	49.78	67.98	29.74	77.82	147.63	87.44	89.63	71.14	**67.69**	**93.98**	**96.50**	**100.31**	**106.14**	**110.66**	**112.79**	**115.31**	**118.10**	**120.13**	**121.83**	**123.17**	**121.90**
1996	28.54	40.35	39.54	37.38	33.29	27.69	29.56	32.19	27.43	34.03	56.83	65.72	69.84	104.64	64.65	52.34	**71.62**	**88.88**	**91.03**	**93.59**	**99.19**	**104.06**	**106.92**	**110.07**	**113.39**	**116.61**	**119.65**	**121.59**	**121.53**	**121.64**
1997	32.05	36.04	35.58	31.97	25.79	25.53	23.43	31.75	44.05	28.82	101.03	78.42	63.94	49.58	67.07	**82.19**	**86.45**	**87.00**	**90.14**	**95.39**	**100.87**	**103.98**	**107.73**	**111.84**	**115.08**	**118.30**	**121.60**	**122.07**	**122.67**	**121.43**
1998	20.63	30.38	24.81	23.58	23.15	27.44	29.73	32.35	45.02	56.67	62.30	69.81	69.47	71.73	**72.57**	**81.33**	**79.74**	**82.29**	**88.19**	**93.60**	**96.70**	**100.43**	**104.76**	**109.04**	**113.43**	**117.21**	**118.45**	**119.55**	**119.46**	**119.74**
1999	23.29	24.00	24.55	23.57	27.49	30.01	33.19	43.45	62.43	60.66	69.82	65.88	56.40	**70.26**	**77.88**	**75.63**	**77.38**	**83.10**	**88.59**	**92.02**	**95.86**	**100.54**	**105.04**	**109.94**	**114.30**	**116.14**	**117.86**	**118.32**	**118.83**	**118.93**
2000	11.99	24.01	24.92	31.50	30.11	32.07	41.37	41.81	85.53	102.90	47.05	75.51	**83.82**	**75.35**	**73.46**	**75.43**	**80.59**	**85.60**	**89.14**	**93.41**	**99.20**	**104.63**	**111.23**	**116.75**	**119.31**	**122.08**	**123.51**	**124.45**	**124.87**	**124.34**
2001	17.67	25.74	30.69	30.98	33.44	40.56	55.75	70.37	72.35	71.58	68.78	**74.16**	**78.43**	**72.39**	**72.94**	**76.92**	**81.28**	**84.32**	**87.92**	**92.68**	**97.72**	**103.52**	**108.88**	**112.11**	**115.60**	**117.88**	**119.93**	**120.94**	**121.52**	**121.16**
2002	16.84	30.17	32.94	33.95	37.30	51.50	63.72	66.85	64.93	68.39	**69.65**	**74.03**	**67.96**	**68.73**	**72.63**	**77.18**	**80.08**	**83.50**	**87.95**	**92.83**	**98.41**	**104.01**	**107.62**	**111.55**	**114.35**	**117.03**	**118.67**	**119.80**	**120.26**	**119.99**
2003	21.84	33.52	34.28	36.99	46.75	60.18	61.75	57.79	59.81	**66.90**	**71.52**	**63.67**	**63.53**	**67.20**	**71.33**	**73.95**	**77.03**	**81.29**	**86.05**	**91.79**	**97.62**	**101.32**	**105.66**	**108.99**	**112.33**	**114.38**	**116.13**	**117.05**	**116.91**	**116.40**
2004	36.33	35.59	36.78	46.10	56.48	60.93	57.27	59.26	**64.75**	**69.00**	**61.38**	**59.56**	**62.75**	**66.72**	**69.18**	**71.97**	**76.12**	**80.91**	**86.71**	**92.67**	**96.55**	**101.11**	**104.81**	**108.51**	**110.97**	**113.25**	**114.71**	**115.08**	**115.01**	**114.70**
2005	36.69	34.79	45.88	58.88	62.49	59.70	60.58	**60.69**	**68.27**	**62.19**	**59.80**	**60.84**	**63.71**	**65.78**	**67.51**	**70.93**	**75.43**	**81.23**	**87.44**	**91.47**	**96.55**	**101.23**	**105.94**	**109.37**	**113.09**	**116.06**	**117.65**	**118.53**	**119.02**	**119.03**
2006	31.09	40.71	58.45	61.48	62.72	64.93	**62.11**	**70.15**	**65.26**	**62.47**	**62.92**	**64.01**	**64.76**	**65.86**	**68.73**	**72.57**	**77.92**	**83.87**	**88.03**	**93.32**	**98.28**	**103.17**	**107.18**	**111.59**	**115.22**	**117.65**	**119.37**	**120.82**	**121.52**	**121.61**
2007	35.46	51.61	62.94	61.70	66.56	**61.24**	**74.56**	**70.58**	**67.92**	**68.06**	**68.22**	**67.23**	**67.50**	**69.74**	**72.88**	**77.55**	**82.84**	**86.31**	**91.30**	**96.17**	**101.43**	**105.75**	**110.90**	**115.23**	**118.38**	**120.91**	**123.37**	**124.96**	**125.69**	**124.88**
2008	38.24	56.48	56.95	62.67	**62.41**	**73.98**	**71.22**	**68.39**	**68.22**	**68.35**	**67.33**	**65.99**	**67.13**	**69.94**	**74.39**	**79.18**	**82.44**	**87.45**	**92.30**	**97.51**	**101.93**	**107.11**	**111.89**	**115.56**	**118.65**	**121.76**	**124.06**	**125.25**	**124.71**	**124.47**
2009	41.50	47.37	51.85	**60.26**	**71.10**	**69.20**	**67.94**	**66.52**	**64.85**	**63.11**	**61.55**	**61.24**	**63.13**	**67.59**	**72.34**	**75.20**	**80.05**	**84.84**	**90.18**	**94.58**	**99.89**	**104.77**	**108.68**	**112.26**	**115.85**	**118.67**	**120.34**	**120.33**	**120.61**	**120.71**
2010	37.54	49.47	**56.69**	**67.55**	**65.79**	**64.20**	**62.62**	**60.49**	**58.45**	**56.92**	**56.66**	**57.54**	**61.34**	**65.89**	**68.52**	**73.24**	**78.08**	**83.57**	**88.13**	**93.72**	**98.85**	**102.99**	**106.92**	**111.19**	**114.74**	**116.96**	**117.38**	**118.33**	**118.89**	**118.45**
2011	36.55	**51.06**	**59.62**	**58.85**	**57.37**	**56.15**	**54.26**	**52.59**	**51.46**	**51.55**	**52.66**	**55.35**	**59.44**	**61.71**	**66.27**	**71.04**	**76.63**	**81.19**	**86.95**	**92.15**	**96.41**	**100.68**	**105.54**	**109.82**	**112.62**	**113.86**	**115.65**	**117.13**	**117.75**	**117.84**
2012	**59.13**	**52.06**	**53.15**	**52.70**	**51.99**	**50.50**	**48.84**	**47.70**	**47.76**	**48.92**	**51.50**	**53.96**	**55.53**	**59.97**	**64.74**	**70.34**	**74.95**	**81.01**	**86.53**	**91.01**	**95.51**	**101.04**	**106.02**	**109.57**	**111.62**	**114.35**	**116.70**	**117.83**	**117.76**	**118.25**
2013	**45.06**	**45.94**	**48.65**	**50.21**	**50.22**	**48.17**	**46.80**	**47.42**	**48.94**	**51.40**	**53.75**	**54.03**	**57.51**	**62.25**	**67.57**	**72.02**	**78.21**	**83.80**	**88.46**	**93.25**	**99.49**	**105.44**	**109.81**	**112.83**	**116.55**	**119.70**	**121.64**	**122.42**	**122.91**	**124.21**
2014	**37.88**	**42.37**	**48.10**	**50.83**	**48.53**	**47.89**	**48.51**	**49.94**	**52.04**	**53.67**	**53.31**	**54.58**	**58.85**	**64.63**	**69.42**	**75.17**	**80.48**	**85.25**	**89.89**	**97.06**	**104.59**	**109.01**	**111.31**	**116.15**	**119.38**	**123.01**	**124.91**	**125.89**	**127.61**	**128.42**
2015	**35.83**	**40.71**	**45.94**	**45.72**	**45.85**	**47.02**	**47.85**	**49.31**	**51.31**	**52.21**	**54.22**	**57.12**	**60.70**	**63.80**	**69.44**	**75.55**	**79.96**	**85.07**	**92.45**	**99.65**	**103.71**	**107.76**	**113.41**	**117.71**	**120.75**	**124.00**	**126.79**	**128.74**	**130.29**	**132.62**
2016	**32.84**	**37.96**	**41.94**	**43.63**	**44.11**	**44.73**	**46.17**	**48.19**	**49.26**	**51.47**	**53.06**	**55.73**	**59.68**	**66.24**	**70.39**	**73.78**	**79.28**	**86.61**	**94.27**	**98.41**	**102.42**	**108.85**	**114.08**	**118.33**	**121.63**	**125.35**	**128.73**	**130.73**	**132.49**	**132.31**
2017	**34.32**	**37.26**	**42.56**	**44.07**	**45.19**	**46.67**	**47.47**	**46.96**	**47.77**	**47.65**	**49.55**	**51.76**	**57.90**	**61.86**	**66.24**	**72.50**	**79.92**	**86.68**	**91.69**	**95.87**	**102.67**	**108.25**	**112.99**	**116.47**	**120.63**	**125.12**	**127.05**	**128.52**	**129.05**	**129.26**
2018	**34.06**	**38.39**	**43.85**	**46.13**	**46.31**	**46.36**	**46.78**	**47.46**	**48.82**	**49.30**	**51.08**	**54.69**	**57.31**	**60.76**	**66.49**	**74.24**	**80.27**	**85.84**	**91.79**	**98.32**	**103.55**	**107.17**	**110.31**	**115.40**	**121.24**	**124.85**	**127.84**	**129.28**	**129.48**	**128.76**
2019	**32.84**	**38.03**	**43.69**	**45.51**	**46.16**	**46.40**	**46.82**	**47.63**	**48.39**	**50.07**	**52.55**	**53.85**	**56.82**	**61.74**	**68.75**	**74.84**	**80.67**	**86.04**	**92.78**	**98.95**	**103.18**	**106.29**	**110.59**	**116.04**	**120.06**	**123.06**	**125.47**	**127.56**	**128.22**	**129.15**

Loss Rates **Fixed Rate 15 Year Mortgages** **by Credit Subsidy Endorsement Cohort**

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1998	0.00	40.98	41.52	41.53	44.26	51.65	40.94	48.00	48.53	56.46	59.21	98.40	154.34	115.59	**222.62**
1999	0.00	31.03	39.06	37.95	41.45	50.12	61.34	117.69	86.77	81.39	109.41	158.30	100.86	**53.23**	**72.44**
2000	0.00	28.57	41.08	37.40	52.90	57.41	72.69	68.41	97.43	158.16	114.79	127.34	**70.59**	**66.63**	**71.59**
2001	0.00	36.71	42.62	46.54	49.88	61.26	83.05	68.08	62.45	48.87	112.70	**64.36**	**66.07**	**64.48**	**65.17**
2002	3.76	43.78	40.27	45.85	42.35	61.83	83.97	87.73	85.70	92.04	**65.53**	**61.49**	**57.87**	**58.78**	**63.74**
2003	73.56	44.40	40.47	46.83	60.69	67.78	74.02	75.03	69.15	**83.69**	**56.83**	**53.29**	**52.47**	**56.96**	**61.06**
2004	31.10	36.21	51.58	55.86	60.34	72.14	65.68	64.45	**61.18**	**58.22**	**55.01**	**49.95**	**54.03**	**58.67**	**61.56**
2005	18.25	43.58	46.58	56.51	62.49	58.09	65.14	**58.92**	**54.50**	**48.65**	**45.42**	**46.75**	**50.11**	**52.85**	**53.73**
2006	39.55	51.57	59.92	67.48	63.01	62.04	**57.05**	**61.58**	**52.17**	**47.65**	**47.93**	**49.81**	**51.36**	**52.75**	**54.76**
2007	56.44	51.94	65.63	59.74	66.16	**61.77**	**69.14**	**60.01**	**51.17**	**49.48**	**50.57**	**50.42**	**50.23**	**52.67**	**54.74**
2008	48.04	52.09	54.43	58.61	**59.60**	**68.23**	**59.39**	**53.15**	**51.05**	**51.63**	**51.14**	**49.95**	**51.15**	**53.71**	**57.80**
2009	51.25	42.47	50.59	**55.77**	**64.83**	**57.10**	**50.89**	**49.51**	**49.68**	**49.11**	**47.94**	**48.69**	**50.99**	**55.35**	**60.16**
2010	0.00	45.01	**49.43**	**56.12**	**49.31**	**43.42**	**42.58**	**42.80**	**42.55**	**41.96**	**42.92**	**44.64**	**48.64**	**53.85**	**57.13**
2011	38.31	**49.58**	**50.91**	**47.12**	**41.99**	**40.91**	**40.46**	**39.72**	**39.03**	**39.96**	**41.95**	**44.72**	**49.21**	**52.74**	**57.25**
2012	**61.41**	**48.24**	**48.33**	**45.16**	**44.01**	**42.78**	**41.16**	**39.29**	**38.98**	**40.33**	**43.51**	**47.05**	**48.87**	**53.21**	**57.74**
2013	**44.96**	**46.35**	**47.68**	**49.02**	**48.69**	**46.03**	**42.90**	**41.86**	**42.50**	**45.01**	**48.41**	**49.15**	**52.31**	**56.75**	**61.50**
2014	**43.50**	**48.16**	**52.46**	**53.41**	**51.07**	**48.32**	**46.33**	**45.53**	**47.42**	**50.42**	**51.22**	**52.97**	**56.36**	**61.02**	**63.74**
2015	**43.96**	**48.46**	**51.93**	**51.14**	**48.91**	**46.84**	**45.54**	**47.24**	**49.29**	**50.06**	**51.77**	**53.95**	**57.89**	**61.32**	**66.24**
2016	**43.01**	**47.85**	**49.45**	**48.20**	**46.51**	**45.35**	**45.75**	**47.14**	**47.43**	**49.30**	**51.05**	**53.62**	**56.40**	**62.00**	**65.99**
2017	**43.79**	**46.52**	**47.81**	**47.26**	**46.48**	**46.57**	**46.66**	**45.82**	**46.91**	**48.54**	**50.92**	**52.56**	**57.56**	**62.04**	**65.53**
2018	**42.51**	**45.20**	**47.17**	**47.56**	**47.75**	**47.34**	**45.57**	**45.56**	**47.36**	**49.55**	**51.15**	**54.61**	**58.13**	**61.91**	**66.50**
2019	**42.96**	**45.92**	**48.43**	**49.29**	**48.99**	**46.96**	**46.10**	**46.58**	**47.72**	**49.05**	**52.45**	**54.73**	**57.56**	**62.35**	**67.55**

Loss Rates **Fixed Rate 15 Year Streamline Refinance Mortgages** **by Credit Subsidy Endorsement Cohort**

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1992	0.00	42.98	36.80	44.80	34.05	49.45	61.98	48.14	85.20	105.38	181.35	193.84	0.00	0.00	0.00
1993	0.00	35.28	42.43	36.36	39.09	49.19	52.57	53.36	39.37	65.24	47.05	36.84	41.43	56.06	609.99
1994	45.00	39.07	40.51	41.29	48.03	51.24	52.70	50.52	60.08	40.17	72.46	112.12	214.76	162.69	187.68
1995	133.47	45.29	40.91	42.16	38.94	48.39	42.18	70.87	39.13	81.04	0.00	159.12	0.00	0.00	765.67
1996	0.00	41.10	55.34	37.81	55.18	35.23	32.31	31.59	73.28	120.27	124.46	190.86	0.00	772.30	0.00
1997	0.00	34.03	49.63	49.84	62.06	52.94	63.11	90.91	24.23	81.46	86.76	0.00	96.95	0.00	0.00
1998	0.00	23.13	30.97	29.41	45.62	42.60	38.81	49.07	164.79	139.06	96.68	127.82	81.39	339.18	**162.33**
1999	0.00	34.50	30.75	24.01	37.73	37.21	34.93	47.53	80.92	76.97	83.41	112.46	117.01	**83.29**	**65.89**
2000	0.00	16.17	41.32	21.59	27.01	60.86	86.36	91.33	123.60	100.19	143.39	0.00	**27.84**	**60.49**	**60.87**
2001	0.00	27.58	39.44	40.90	44.73	50.38	60.16	150.09	126.72	96.28	92.93	**69.95**	**65.33**	**66.01**	**60.88**
2002	0.00	34.97	40.31	41.38	43.81	59.26	69.60	72.61	100.91	59.78	**58.59**	**56.87**	**52.47**	**57.06**	**61.96**
2003	0.00	35.74	32.57	42.40	65.32	67.59	89.63	71.86	73.06	**54.36**	**56.50**	**49.34**	**50.67**	**55.62**	**60.95**
2004	34.41	40.38	36.97	48.81	61.26	66.53	68.16	59.24	**57.67**	**52.50**	**47.29**	**45.71**	**50.31**	**55.88**	**60.18**
2005	45.00	35.37	52.18	64.37	59.60	58.49	72.65	**49.98**	**50.88**	**46.66**	**43.08**	**45.58**	**50.78**	**55.87**	**59.01**
2006	0.00	42.04	60.53	55.93	68.41	65.70	**65.13**	**52.77**	**46.55**	**42.13**	**41.65**	**44.10**	**47.63**	**50.73**	**55.26**
2007	0.00	42.88	60.86	41.10	93.13	**48.76**	**56.49**	**46.34**	**43.72**	**41.41**	**43.20**	**44.37**	**47.11**	**51.33**	**55.44**
2008	0.00	41.35	70.18	50.13	**54.73**	**59.42**	**46.70**	**44.54**	**43.90**	**45.45**	**46.53**	**45.92**	**48.40**	**51.74**	**57.55**
2009	0.00	43.43	48.70	**61.94**	**62.84**	**52.66**	**46.18**	**43.47**	**43.01**	**43.47**	**43.03**	**44.71**	**47.45**	**52.83**	**58.68**
2010	57.34	44.89	**60.24**	**62.99**	**53.75**	**46.22**	**42.87**	**42.29**	**42.46**	**41.86**	**43.07**	**44.58**	**49.47**	**55.54**	**59.40**
2011	0.00	**50.48**	**56.54**	**51.19**	**45.02**	**42.17**	**40.88**	**40.71**	**39.86**	**41.12**	**43.04**	**45.69**	**50.60**	**54.45**	**58.88**
2012	**60.88**	**43.91**	**43.82**	**39.56**	**36.92**	**35.85**	**35.63**	**34.63**	**35.65**	**37.92**	**41.00**	**44.61**	**47.28**	**51.93**	**56.68**
2013	**34.71**	**38.03**	**40.05**	**40.42**	**39.91**	**38.46**	**36.15**	**36.49**	**38.36**	**40.88**	**44.21**	**45.56**	**49.26**	**54.01**	**58.88**
2014	**29.22**	**36.17**	**41.70**	**44.09**	**41.25**	**38.67**	**37.65**	**37.98**	**40.35**	**42.60**	**42.72**	**44.70**	**48.56**	**54.62**	**58.25**
2015	**27.70**	**35.46**	**40.61**	**39.61**	**37.80**	**37.26**	**36.97**	**38.63**	**41.11**	**42.84**	**44.87**	**47.73**	**51.80**	**55.04**	**60.05**
2016	**25.72**	**33.24**	**36.85**	**36.47**	**35.50**	**35.20**	**36.33**	**38.50**	**40.22**	**43.09**	**44.92**	**47.93**	**50.79**	**56.44**	**61.05**
2017	**26.41**	**32.16**	**35.11**	**35.06**	**35.09**	**35.89**	**37.04**	**36.82**	**38.00**	**38.56**	**41.28**	**43.34**	**49.12**	**53.80**	**57.69**
2018	**26.26**	**31.87**	**35.69**	**36.84**	**36.24**	**36.17**	**36.36**	**37.32**	**39.46**	**40.89**	**43.49**	**47.55**	**50.94**	**54.67**	**59.40**
2019	**25.67**	**32.08**	**36.31**	**37.22**	**37.46**	**36.46**	**36.44**	**38.06**	**39.52**	**42.08**	**45.25**	**47.19**	**51.16**	**56.04**	**61.63**

Loss Rates **Adjustable Rate Mortgages** **by Credit Subsidy Endorsement Cohort**

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1991	69.80	36.29	44.40	48.81	47.10	45.75	47.64	53.30	47.66	41.11	34.70	46.54	32.64	21.24	75.81	106.86	54.08	112.81	92.99	126.95	170.37	**62.50**	**109.39**	**106.05**	**99.63**	**104.29**	**107.22**	**107.42**	**107.22**	**107.45**
1992	37.11	43.98	44.05	44.15	43.11	46.23	46.11	43.54	41.17	36.41	25.02	30.66	32.70	21.29	31.92	71.22	78.79	86.35	101.27	74.51	**74.86**	**97.63**	**103.07**	**98.60**	**103.31**	**107.08**	**108.19**	**108.36**	**109.03**	**109.20**
1993	40.66	41.21	41.36	39.78	42.95	42.73	40.78	37.12	30.30	26.78	26.60	27.36	45.08	55.90	69.36	89.11	69.06	81.36	92.14	**74.84**	**97.47**	**94.79**	**97.09**	**101.76**	**105.76**	**107.43**	**107.96**	**108.97**	**108.91**	**108.26**
1994	26.75	39.65	40.67	40.32	39.75	36.12	32.30	28.09	26.07	31.68	30.85	42.93	38.98	61.69	115.58	70.21	77.17	86.66	**75.85**	**94.21**	**96.23**	**93.63**	**98.67**	**103.35**	**105.85**	**107.55**	**109.54**	**110.65**	**110.71**	**108.70**
1995	44.80	40.65	41.66	40.99	38.34	35.32	31.63	28.55	35.89	35.89	40.00	47.27	83.26	76.36	86.58	78.94	79.46	**74.21**	**91.24**	**89.22**	**92.00**	**98.01**	**103.25**	**106.08**	**108.06**	**110.41**	**112.15**	**112.74**	**111.41**	**109.60**
1996	40.70	41.00	38.59	34.87	33.94	31.04	27.91	32.83	36.27	36.28	45.98	65.96	78.62	77.48	57.38	86.59	**69.64**	**82.93**	**82.86**	**84.29**	**91.32**	**97.52**	**101.16**	**104.20**	**106.86**	**109.11**	**111.00**	**111.03**	**110.02**	**110.39**
1997	26.53	38.43	34.33	32.11	30.41	29.49	31.98	36.53	39.67	45.60	62.40	81.88	80.32	80.59	73.35	**68.33**	**81.99**	**79.81**	**81.42**	**88.55**	**94.95**	**98.73**	**101.94**	**104.75**	**107.55**	**110.27**	**110.67**	**109.88**	**110.63**	**110.07**
1998	31.33	36.14	30.34	29.99	29.72	32.24	35.84	33.05	49.16	53.78	67.35	75.44	69.86	78.55	**69.22**	**79.11**	**74.96**	**76.48**	**83.46**	**89.67**	**93.65**	**97.26**	**100.63**	**104.00**	**106.97**	**107.97**	**107.21**	**108.09**	**108.36**	**108.44**
1999	0.00	30.61	27.90	27.86	29.11	30.97	35.05	36.11	51.10	61.52	63.68	65.31	77.68	**61.26**	**75.03**	**71.19**	**69.40**	**76.60**	**83.52**	**87.88**	**92.91**	**96.00**	**99.08**	**102.72**	**105.02**	**105.38**	**107.47**	**108.74**	**109.42**	**108.47**
2000	20.74	29.83	28.26	32.88	34.68	36.77	39.14	50.98	64.02	62.99	60.35	67.69	**65.01**	**72.99**	**66.23**	**67.90**	**75.11**	**81.94**	**85.90**	**89.85**	**92.89**	**96.46**	**100.78**	**102.69**	**103.72**	**106.80**	**108.95**	**110.37**	**110.29**	**111.28**
2001	0.00	28.01	33.45	35.44	38.65	41.22	53.15	64.82	66.34	67.12	65.49	**62.22**	**74.37**	**68.59**	**66.86**	**72.93**	**78.66**	**81.81**	**85.84**	**89.27**	**92.79**	**97.53**	**101.77**	**103.59**	**106.51**	**108.50**	**110.39**	**110.68**	**111.46**	**110.36**
2002	17.95	30.46	35.30	32.20	38.99	47.13	61.17	63.10	65.23	67.45	**64.78**	**73.50**	**65.66**	**64.80**	**69.79**	**74.54**	**77.27**	**81.24**	**84.51**	**88.27**	**93.28**	**97.10**	**98.35**	**101.88**	**105.37**	**108.22**	**108.70**	**110.34**	**110.18**	**109.62**
2003	20.11	35.31	33.39	37.79	48.24	55.58	65.92	62.55	65.06	**66.32**	**74.04**	**65.19**	**63.70**	**68.14**	**72.61**	**75.30**	**78.47**	**82.17**	**86.12**	**90.86**	**95.35**	**96.54**	**99.58**	**103.40**	**106.75**	**107.55**	**109.88**	**110.05**	**109.50**	**107.96**
2004	35.93	35.05	36.52	46.59	56.49	63.14	61.35	62.31	**63.83**	**71.94**	**64.60**	**60.43**	**64.81**	**69.27**	**71.16**	**73.67**	**76.78**	**80.67**	**85.70**	**90.77**	**92.94**	**96.47**	**100.21**	**103.89**	**105.37**	**107.84**	**108.62**	**108.67**	**107.53**	**107.22**
2005	35.60	36.54	47.93	57.85	62.87	61.34	65.55	**64.55**	**71.72**	**63.69**	**59.11**	**61.41**	**64.85**	**66.45**	**67.85**	**70.30**	**73.90**	**79.34**	**84.84**	**86.84**	**90.90**	**95.64**	**100.10**	**102.59**	**106.18**	**108.47**	**109.53**	**109.50**	**109.95**	**109.47**
2006	27.18	46.35	58.80	64.39	61.51	63.08	**62.68**	**72.19**	**65.54**	**60.32**	**62.37**	**64.88**	**65.21**	**65.89**	**67.49**	**70.18**	**76.21**	**82.12**	**83.76**	**87.88**	**92.80**	**97.49**	**100.77**	**104.83**	**108.15**	**110.34**	**111.51**	**112.83**	**112.95**	**112.67**
2007	0.00	50.73	57.86	59.81	62.76	**60.35**	**70.43**	**64.17**	**59.80**	**61.09**	**63.13**	**62.81**	**63.03**	**64.55**	**67.18**	**73.03**	**78.64**	**79.67**	**83.25**	**87.96**	**93.02**	**96.64**	**101.57**	**105.40**	**108.13**	**110.49**	**112.56**	**113.56**	**113.73**	**113.41**
2008	12.12	48.83	46.00	55.06	**55.87**	**65.69**	**60.33**	**57.25**	**58.43**	**60.09**	**59.72**	**58.94**	**60.07**	**63.49**	**69.04**	**74.72**	**76.07**	**79.50**	**84.02**	**88.78**	**92.84**	**97.82**	**102.35**	**105.81**	**108.76**	**111.80**	**113.88**	**114.93**	**115.32**	**114.83**
2009	32.91	37.68	47.62	**54.46**	**61.18**	**56.57**	**53.53**	**54.57**	**56.30**	**56.11**	**55.92**	**56.98**	**59.60**	**64.82**	**70.81**	**70.75**	**73.21**	**78.22**	**83.92**	**87.91**	**93.42**	**98.13**	**101.73**	**105.09**	**108.83**	**111.34**	**112.50**	**113.15**	**113.26**	**113.20**
2010	26.29	32.09	**46.80**	**51.72**	**47.74**	**45.85**	**47.78**	**49.98**	**50.47**	**50.85**	**52.19**	**53.80**	**57.41**	**63.09**	**63.60**	**65.42**	**70.06**	**75.95**	**79.43**	**86.08**	**91.30**	**95.27**	**98.73**	**103.46**	**106.74**	**108.73**	**109.72**	**110.09**	**110.47**	**109.95**
2011	0.00	**36.05**	**45.38**	**44.34**	**43.49**	**45.72**	**48.08**	**48.75**	**49.66**	**51.62**	**53.42**	**55.62**	**60.66**	**61.13**	**62.05**	**66.13**	**72.08**	**75.40**	**82.68**	**88.14**	**92.27**	**96.21**	**101.99**	**106.21**	**108.79**	**110.28**	**111.71**	**112.94**	**112.78**	**112.53**
2012	**46.09**	**39.15**	**40.62**	**41.15**	**43.67**	**46.41**	**47.48**	**48.49**	**50.71**	**52.57**	**54.48**	**57.73**	**58.07**	**58.63**	**62.35**	**68.39**	**71.17**	**78.90**	**84.40**	**88.53**	**92.63**	**99.27**	**104.48**	**107.77**	**109.39**	**111.69**	**113.61**	**114.23**	**114.07**	**114.52**
2013	**33.99**	**35.95**	**39.69**	**43.08**	**46.05**	**46.55**	**47.55**	**49.46**	**51.04**	**53.72**	**57.38**	**55.04**	**54.42**	**58.10**	**63.91**	**66.56**	**74.43**	**80.14**	**84.48**	**88.99**	**95.71**	**101.70**	**106.19**	**109.19**	**112.45**	**115.30**	**116.83**	**117.54**	**118.33**	**118.76**
2014	**31.99**	**36.23**	**41.85**	**46.07**	**45.59**	**46.92**	**48.81**	**50.91**	**58.13**	**56.86**	**53.53**	**53.03**	**56.06**	**60.83**	**64.08**	**71.09**	**76.41**	**80.66**	**85.50**	**91.84**	**97.96**	**102.55**	**107.13**	**111.27**	**114.72**	**117.08**	**119.51**	**121.03**	**121.78**	**122.66**
2015	**31.50**	**35.39**	**40.80**	**42.55**	**44.52**	**47.02**	**50.06**	**55.00**	**52.79**	**51.54**	**52.70**	**54.88**	**58.33**	**61.32**	**67.96**	**72.83**	**76.57**	**81.04**	**87.16**	**93.60**	**98.41**	**103.30**	**108.20**	**111.94**	**114.99**	**118.59**	**120.76**	**122.18**	**123.73**	**123.13**
2016	**30.51**	**35.04**	**38.78**	**41.54**	**44.22**	**47.21**	**52.99**	**51.99**	**50.22**	**51.16**	**52.86**	**54.78**	**57.16**	**63.76**	**67.85**	**71.19**	**75.50**	**81.60**	**88.03**	**93.16**	**98.10**	**103.42**	**107.51**	**111.12**	**115.13**	**118.40**	**120.90**	**122.94**	**122.69**	**121.85**
2017	**31.03**	**34.12**	**38.65**	**42.47**	**46.37**	**52.40**	**51.22**	**50.14**	**51.16**	**52.58**	**53.65**	**54.65**	**59.89**	**63.40**	**66.18**	**70.32**	**76.80**	**83.05**	**88.42**	**93.27**	**98.45**	**102.93**	**106.51**	**110.77**	**114.81**	**118.34**	**121.04**	**121.40**	**121.34**	**120.81**
2018	**30.54**	**34.52**	**39.99**	**44.65**	**49.32**	**49.08**	**49.09**	**50.62**	**52.33**	**53.29**	**54.14**	**57.40**	**59.59**	**61.84**	**65.79**	**71.93**	**77.84**	**83.22**	**88.01**	**93.54**	**98.25**	**101.87**	**105.99**	**110.17**	**113.76**	**117.14**	**118.17**	**119.61**	**119.76**	**119.77**
2019	**33.20**	**37.76**	**43.98**	**47.07**	**47.58**	**48.67**	**50.56**	**52.36**	**53.30**	**53.91**	**56.94**	**57.49**	**58.50**	**62.14**	**67.80**	**73.30**	**78.19**	**83.02**	**89.44**	**94.34**	**98.41**	**102.65**	**105.81**	**108.85**	**112.93**	**115.21**	**117.97**	**119.05**	**119.82**	**120.46**

Loss Rates **Adjustable Rate Streamline Refinance Mortgages** **by Credit Subsidy Endorsement Cohort**

Book\Po	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1994	42.56	42.48	44.38	48.48	48.14	43.33	37.02	27.94	20.17	18.89	66.00	61.49	118.80	0.00	97.82	54.21	70.67	85.63	**90.07**	**97.80**	**96.56**	**98.35**	**103.41**	**107.90**	**108.56**	**110.24**	**112.37**	**114.97**	**115.07**	**114.41**
1995	0.00	43.78	37.21	45.63	34.17	40.82	17.81	2.75	14.43	35.99	45.00	14.53	88.56	140.07	47.46	155.09	129.43	**88.24**	**89.28**	**90.60**	**96.51**	**104.55**	**110.11**	**110.93**	**113.23**	**115.31**	**119.43**	**121.28**	**119.99**	**118.52**
1996	0.31	35.36	37.14	36.00	27.44	23.05	20.17	34.11	54.93	23.76	46.72	46.02	43.76	185.43	48.36	39.78	**78.08**	**89.12**	**88.38**	**91.04**	**98.66**	**104.52**	**106.00**	**110.02**	**112.80**	**117.18**	**118.68**	**119.59**	**119.75**	**119.98**
1997	28.26	38.57	31.10	29.55	26.07	18.22	27.04	28.51	58.36	29.03	34.89	60.49	70.88	87.01	74.52	**63.97**	**86.60**	**85.58**	**86.70**	**91.95**	**97.81**	**100.76**	**104.74**	**110.02**	**116.24**	**118.43**	**117.54**	**117.54**	**118.45**	**118.19**
1998	28.73	26.03	27.47	23.37	16.83	26.50	31.97	28.39	20.39	0.00	31.72	-35.01	55.66	50.37	**66.19**	**76.29**	**76.51**	**81.46**	**89.18**	**95.34**	**97.72**	**102.44**	**105.69**	**108.84**	**110.58**	**112.84**	**114.21**	**115.96**	**115.99**	**115.48**
1999	0.00	26.87	25.04	21.07	25.70	36.74	31.10	37.08	76.79	87.67	49.68	30.41	83.74	**69.27**	**72.90**	**70.15**	**71.58**	**78.30**	**84.38**	**89.03**	**94.48**	**99.08**	**105.34**	**108.10**	**108.93**	**111.28**	**113.92**	**115.30**	**116.20**	**115.82**
2000	0.00	31.84	25.05	26.66	34.46	26.45	31.07	59.12	64.01	41.58	65.33	47.25	**70.13**	**74.20**	**72.64**	**75.84**	**82.03**	**87.70**	**91.16**	**96.42**	**100.20**	**106.23**	**108.50**	**108.57**	**111.75**	**115.14**	**116.21**	**117.69**	**118.21**	**119.07**
2001	25.08	28.48	36.81	35.00	30.91	42.05	58.24	70.94	61.52	64.29	51.76	**75.11**	**72.71**	**68.30**	**71.59**	**76.36**	**80.62**	**83.52**	**88.44**	**92.68**	**97.67**	**101.46**	**104.94**	**109.32**	**112.89**	**114.95**	**116.89**	**117.64**	**118.88**	**119.21**
2002	11.76	26.20	30.95	31.64	37.12	49.12	66.35	66.11	66.20	68.05	**65.57**	**72.35**	**64.58**	**65.76**	**69.07**	**73.22**	**76.67**	**81.15**	**86.34**	**93.31**	**98.24**	**101.00**	**104.96**	**109.24**	**112.12**	**114.66**	**115.98**	**117.66**	**118.13**	**117.63**
2003	23.52	31.59	31.88	33.25	45.72	56.72	62.59	59.62	68.76	**65.39**	**70.11**	**63.06**	**65.06**	**68.77**	**72.57**	**75.75**	**80.13**	**84.45**	**92.37**	**97.17**	**98.31**	**102.21**	**106.92**	**110.33**	**113.15**	**114.69**	**117.06**	**118.18**	**117.84**	**117.02**
2004	30.41	31.93	35.84	46.68	54.99	61.36	58.08	60.75	**68.07**	**72.19**	**64.24**	**63.38**	**65.84**	**68.98**	**71.40**	**75.16**	**80.11**	**87.62**	**93.00**	**94.36**	**98.41**	**103.30**	**107.16**	**110.73**	**113.09**	**115.73**	**117.26**	**117.64**	**117.14**	**117.34**
2005	29.74	32.37	48.44	59.83	61.95	60.31	56.27	**63.65**	**69.86**	**62.97**	**61.59**	**62.21**	**64.60**	**66.76**	**69.84**	**74.41**	**81.82**	**87.79**	**89.04**	**92.86**	**98.10**	**102.65**	**106.77**	**109.91**	**113.69**	**116.46**	**118.02**	**118.61**	**119.37**	**119.77**
2006	0.00	45.31	52.39	59.68	53.76	65.37	**53.87**	**71.15**	**63.53**	**63.24**	**64.39**	**64.50**	**65.58**	**67.89**	**71.48**	**79.47**	**86.32**	**84.38**	**87.58**	**93.81**	**98.86**	**102.69**	**106.38**	**110.81**	**114.10**	**116.56**	**117.65**	**119.66**	**120.57**	**120.16**
2007	0.00	56.28	80.86	67.89	64.62	**73.14**	**72.42**	**66.41**	**62.40**	**60.11**	**59.14**	**59.91**	**61.45**	**71.08**	**90.14**	**96.68**	**88.73**	**85.51**	**89.73**	**95.18**	**99.42**	**102.94**	**108.78**	**112.67**	**114.14**	**116.57**	**119.34**	**122.00**	**120.78**	**120.44**
2008	0.00	46.07	59.79	70.50	**68.92**	**72.16**	**67.95**	**64.63**	**63.08**	**62.03**	**61.20**	**61.26**	**65.20**	**76.10**	**82.57**	**78.18**	**80.22**	**85.52**	**90.84**	**95.54**	**98.94**	**103.99**	**108.87**	**112.31**	**115.74**	**119.14**	**121.51**	**122.79**	**122.68**	**121.48**
2009	43.03	50.54	54.51	**62.30**	**69.95**	**66.51**	**64.88**	**62.80**	**60.94**	**59.43**	**59.02**	**61.31**	**68.73**	**75.92**	**73.74**	**75.77**	**80.46**	**85.47**	**90.34**	**94.22**	**99.74**	**104.28**	**108.17**	**111.67**	**115.77**	**118.97**	**121.39**	**121.97**	**122.07**	**122.38**
2010	35.91	45.52	**59.77**	**65.95**	**63.05**	**61.47**	**59.50**	**58.12**	**56.90**	**56.70**	**59.50**	**67.23**	**73.73**	**70.73**	**72.14**	**76.60**	**81.46**	**86.41**	**90.50**	**95.90**	**100.75**	**104.78**	**108.52**	**112.82**	**116.64**	**119.00**	**119.93**	**120.32**	**120.60**	**119.07**
2011	44.82	**50.06**	**56.40**	**54.90**	**54.21**	**53.42**	**52.64**	**51.79**	**52.14**	**55.26**	**62.88**	**68.76**	**64.18**	**64.97**	**69.05**	**73.68**	**78.42**	**82.36**	**88.06**	**93.22**	**97.56**	**101.92**	**106.94**	**111.65**	**114.93**	**116.57**	**117.88**	**118.81**	**118.34**	**117.89**
2012	**57.50**	**47.76**	**49.35**	**50.44**	**50.54**	**50.32**	**49.30**	**49.90**	**53.16**	**60.22**	**67.20**	**61.64**	**60.92**	**64.77**	**69.39**	**74.35**	**78.23**	**83.99**	**89.24**	**93.74**	**98.49**	**104.15**	**109.51**	**113.78**	**116.46**	**118.49**	**120.04**	**120.33**	**120.13**	**120.23**
2013	**39.14**	**42.69**	**47.34**	**48.96**	**49.05**	**47.50**	**47.95**	**51.25**	**58.28**	**64.18**	**59.11**	**57.74**	**61.01**	**65.82**	**70.51**	**74.32**	**80.04**	**85.19**	**89.59**	**94.55**	**100.65**	**106.46**	**111.51**	**115.25**	**118.16**	**120.40**	**121.44**	**122.11**	**122.52**	**122.41**
2014	**34.52**	**41.32**	**46.98**	**48.61**	**46.65**	**49.36**	**56.47**	**69.21**	**69.61**	**57.85**	**54.34**	**56.03**	**60.58**	**65.70**	**69.83**	**75.43**	**80.31**	**85.02**	**90.18**	**96.84**	**103.84**	**109.16**	**112.19**	**116.42**	**119.80**	**123.15**	**124.57**	**124.92**	**124.80**	**125.50**
2015	**33.22**	**40.41**	**45.07**	**45.06**	**45.20**	**47.43**	**50.79**	**52.06**	**53.11**	**53.53**	**56.33**	**59.35**	**62.26**	**65.09**	**70.11**	**75.72**	**80.40**	**85.53**	**91.68**	**98.47**	**103.92**	**108.32**	**113.32**	**117.17**	**120.70**	**123.68**	**124.97**	**125.61**	**126.91**	**126.37**
2016	**31.36**	**37.81**	**42.06**	**43.44**	**45.12**	**48.99**	**50.90**	**50.81**	**52.10**	**54.23**	**56.01**	**58.40**	**61.56**	**66.70**	**70.98**	**74.97**	**80.00**	**86.48**	**93.63**	**99.02**	**102.95**	**109.06**	**113.05**	**117.17**	**120.62**	**122.82**	**124.96**	**127.41**	**127.58**	**125.35**
2017	**31.95**	**37.71**	**44.12**	**49.78**	**60.24**	**59.34**	**51.62**	**51.17**	**51.87**	**52.12**	**53.96**	**55.50**	**59.79**	**64.30**	**68.90**	**74.21**	**81.34**	**87.52**	**93.68**	**98.26**	**103.69**	**108.15**	**112.10**	**115.87**	**119.74**	**123.33**	**126.35**	**126.16**	**125.45**	**124.88**
2018	**30.35**	**37.70**	**45.73**	**51.70**	**51.40**	**49.93**	**51.37**	**52.15**	**52.72**	**52.85**	**54.25**	**56.66**	**59.19**	**62.03**	**66.57**	**75.24**	**81.04**	**88.04**	**93.98**	**98.78**	**103.03**	**106.68**	**110.15**	**113.55**	**117.46**	**121.35**	**122.73**	**123.38**	**123.21**	**123.44**
2019	**29.86**	**39.36**	**47.34**	**49.15**	**49.35**	**50.16**	**50.87**	**51.71**	**52.62**	**54.02**	**56.15**	**57.36**	**59.52**	**64.20**	**71.28**	**77.17**	**83.80**	**90.37**	**96.27**	**100.61**	**105.11**	**108.68**	**110.28**	**113.17**	**117.16**	**119.30**	**121.34**	**122.58**	**123.25**	**124.48**

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