# Actuarial Review of the Federal Housing Administration Mutual Mortgage Insurance Fund Forward Loans for Fiscal Year 2011

**October 12, 2011**

**Prepared for**

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

**By**

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October 12, 2011

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:

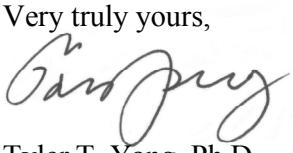
IFE Group has completed and, along with this letter, is submitting the fiscal year 2011 Actuarial Review of the Mutual Mortgage Insurance Fund Forward Loans (the Fund).

We estimate that the Fund's economic value as of the end of fiscal year 2011 was $1.19 billion and the unamortized insurance in force was $1,069.35 billion. We project that at the end of fiscal year 2018 the Fund's economic value will be $59.45 billion and the unamortized insurance in force will be $1,637.98 billion. We also estimate that the economic value could be negative in FY 2011, and stay negative through FY 2018, 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
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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) 2011.

The Housing and Economic Recovery Act of 2008 (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 by HUD and is excluded from the FY 2011 Actuarial Review reported here. ***In the remainder of this Review, the term "the Fund" refers to the MMI Fund excluding HECMs.***

The primary purpose of this study is to estimate

- the *economic value* of the Fund, defined as the sum of existing capital resources 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*.

Under the base-case assumptions we estimate that the economic value of the Fund as of the end of FY 2011 is $1.19 billion. This represents a decrease of 77 percent from the $5.16 billion economic value as of the end of FY 2010. This decrease is a result of several significant offsetting changes. Because the HECM business is excluded from this analysis, we do not report the capital ratio of the Fund.

We also conclude that under more pessimistic economic scenarios than those represented by the base-case assumptions, the economic value could be negative in FY 2011 and stay negative until FY 2018.

### A. Status of the Fund

Exhibit ES-1 reports the base-case estimates of the Fund's current and future economic value and insurance in force (IIF). 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 2011 to 2018 ($ 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** |
| 2011 | 1,193 | 1,069,354 | 1,009,153 | 10,549 | 219,402 | |
| 2012 | 9,351 | 1,131,977 | 1,057,880 | 8,152 | 153,923 | 7 |
| 2013 | 15,637 | 1,185,849 | 1,096,849 | 6,093 | 136,430 | 193 |
| 2014 | 23,500 | 1,262,510 | 1,157,012 | 7,446 | 166,753 | 417 |
| 2015 | 32,515 | 1,376,174 | 1,252,132 | 8,345 | 206,430 | 670 |
| 2016 | 41,134 | 1,518,917 | 1,375,996 | 7,657 | 199,156 | 962 |
| 2017 | 49,865 | 1,556,638 | 1,393,483 | 7,268 | 193,575 | 1,463 |
| 2018 | 59,448 | 1,637,984 | 1,452,944 | 7,478 | 199,247 | 2,105 |

[a] All values are as of the end of each fiscal year. The economic value for each future year (FYs 2012 through 2018) 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, 2011, 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.

We also projected the performance of the Fund under five alternative future economic scenarios to assess the sensitivity of the results to key assumptions. Under the most adverse scenario, the economic value of the Fund at the end FY 2011 would be *negative* $42.75 billion, and the economic value would remain negative through 2018. Although under the base-case projection no additional sources of funds would be needed to cover future claim losses, if the future experience is slightly worse than the base-case projection this may no longer be the case.

## B. Sources of Change in the Status of the Fund

*Change in Economic Value from FY 2010 to FY 2011*

We estimate that the economic value of the Fund was $1.19 billion as of the end of FY 2011, which represents a decrease of $3.97 billion compared to the economic value of $5.16 billion as of the end of FY 2011 reported in last year's Actuarial Review. This represents a 77 percent decrease in the estimated economic value of the Fund over the past year. Meanwhile, there has been a 15 percent increase in the estimated unamortized IIF from $926.25 billion to $1,069.35 billion.

*Current Estimate of FY 2011 Economic Value Compared with the Estimate Presented in the FY 2010 Actuarial Review*

Our current estimate of the FY 2011 economic value is $9.78 billion lower than the economic value projected for FY 2011 in the FY 2010 Actuarial Review. Our current estimate of the FY 2017 economic value is $49.87 billion, which is $10.28 billion higher than estimated in the FY 2010 Actuarial Review. The FY 2011 differences are attributed to the following changes, with the magnitude of the change in the FY 2011 economic value for each of the changes shown in parentheses:

- including the adjustment for a transfer from the Fund to the HECM financing account (-$0.53 billion),
- using the updated data to estimate origination volume of the FY 2010 to FY 2011 books of business (-$1.33 billion),
- updating the forecasts of future economic conditions and insurance in force as of End of FY 2011 (-$0.44 billion),
- updating the econometric, status transition, and loss severity rate models and portfolio delinquency status (-$5.76 billion),
- updating OMB present value factors (-$1.30 billion)
- updating FHA's new insurance premium schedule (+$1.37 billion), and
- adjusting FY 2012 claims for the large inventory of foreclosed loans (-$1.78 billion).

In total, the economic value of the Fund decreased during FY 2011 and is $3.97 billion lower than that of last year.

The projected FY 2017 economic value is $10.28 billion higher than the level forecasted in last year's Review. This represents a net effect of several large changes, including a decrease of $0.69 billion due to adjusting for a Fund transfer to the HECM account; a decrease of $11.34 billion due to updates to the actual and projected volumes of 2010-2018 endorsement books; an increase of $8.42 billion due to updated economic forecasts and size of insurance in force as of end of FY 2011; an increase of $3.31 billion due to the enhancement of analytical models; a decrease of $2.54 billion due to the updated OMB discount factors; an increase of $15.18 billion due to the most recent change in the FHA mortgage insurance premium structure; and a decrease of $2.06 billion due to the adjustment for the large inventory of foreclosed but not yet claimed loans. The year over year changes in FY economic values also reflect the high uncertainty of the current global economic environment and FHA's corresponding policy modifications. Our sensitivity analysis indicates that the economic value of the Fund could be negative if future economic conditions turn out to be worse than Moody's July 2011 baseline economic forecast.

*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 forecasts by Moody's Analytics and the assumption that FHA does not change its policies regarding refunds, premiums, distributive shares, underwriting 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 continued to adopt the convention of using the end of March data from the FHA data warehouse, supplemented with various updates up to August 2011. 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 2018 depend on many factors. One of the most important factors is the nation's future economic condition during the remaining lifetime of the Fund's books of business. 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
- Growth rate of local house prices
- Dispersion among individual house price appreciation rates and volatility of average local house price appreciation rates
- Office of Management and Budget's present value discount factors

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 in this report are based 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 macro/regional-economic variables including local unemployment rates, as of July 2011. The actuarial estimates are based on the Moody's base case projection that the declining house price trend will finally end in FY 2012 and then return to positive growth. The average growth rate among all MSAs gradually converges to a 3.1 percent long-term stable annual rate. This long-term growth rate is higher than the 2.8 percent in last year's Moody's forecast.

We considered five alternative scenarios to assess the strength of the Fund to withstand a range of future market conditions. The first four scenarios are modified versions of Moody's alternative scenarios: (1) stronger near-term rebound; (2) mild second recession; (3) deeper second recession, and (4) protracted slump. Moody's estimates that these scenarios represent the $10^{th}$, $75^{th}$, $90^{th}$, and $96^{th}$ percentiles of the distribution of possible future economic conditions, respectively. A fifth, low interest rates scenario was constructed to investigate the impact of sustained low interest rates on the performance of the Fund. These five scenarios do not represent the full range of possible experience, but they each represent significant variations from the base case. They demonstrate the sensitivity of the results to different stressful variations in economic conditions, and hence provide insights into the capability of the Fund to withstand even more difficult economic environments. The results of these sensitivity analyses on the Fund's performance are presented in Exhibit ES-2.

Compared to the base case, the estimated FY 2011 economic value under the most severe alternative scenario is projected to be -$42.75 billion. Under this scenario the economic value of the Fund is projected to remain negative through FY 2018. In contrast, under the stronger near-term rebound scenario, the economic value for FY 2011 is estimated to be $4.42 billion, which is $3.23 billion higher than that of the base-case estimate. If the interest rates remain low for the next several years, it will have a negative impact on the economic value of FY 2011 but positive impacts on the future years. Although under the base-case projection no additional sources of funds would be needed to cover future claim losses, if the future experience is slightly worse than the base-case projection this may no longer be the case.

**Exhibit ES-2**

| Projected Fund's Economic Value Under Alternative Economic Scenarios ($millions) | | | | | | |
|---|---|---|---|---|---|---|
| **Fiscal Year** | **Base Case** | **Stronger Near-term Rebound** | **Mild 2nd Recession** | **Deeper 2nd Recession** | **Protracted Slump** | **Low Interest Rates** |
| FY 2011 Economic Value | 1,193 | 4,416 | -17,995 | -31,538 | -42,754 | -4,931 |
| FY 2018 Economic Value | 59,448 | 67,465 | 27,169 | 4,542 | -13,773 | 63,156 |

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 are 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 $15.32 billion in FY 2011.

## 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 maintains 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 2011. One of the programs that 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 to be used by the Secretary of HUD 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 projected future economic conditions from Moody's economy.com.

### A. Implementation of NAHA

Following the issuance of the FY 1989 Actuarial Review and the ensuing debate, Congress mandated various changes to the MMI Fund. The required revisions to the MMI Fund focused on five major issues: 1) the 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 the 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 by providing specific capital standards for the Fund and timeframes over which these standards should be initially 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 capital 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 achieves 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 estimates of Fund performance, we have assumed the continuation of the current HUD policy that no distributive shares will be paid, and we continue with this assumption herein.

## B. FHA Policy Developments and Underwriting Changes

Since the mid-1990's, FHA has implemented several policy changes that affected the financial strength of the MMI Fund. Some of the 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 the flexibility to underwrite creditworthy non-traditional and underserved borrowers, and clarify certain underwriting requirements so that they are not 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 buydown for ARMs is no longer acceptable.

HERA also increased the minimum borrower cash equity investment requirement to 3.5 percent, which is equivalent to restricting the maximum loan-to-value to 96.5 percent for all FHA endorsed loans.[1] 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.

**2. Changes to Homeownership Counseling**

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 funding for 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. For a loan to be eligible for FHA insurance, the homebuyer counseling programs accepted by Freddie Mac or Fannie Mae also must meet this requirement. 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.

**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 automatic 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 apply FHA's Technology-Open-To-Approved-Lenders (TOTAL) mortgage scorecard to evaluate loan applications for possible automated approval for FHA insurance. More than two-thirds of loans submitted generally receive automated approval, eliminating the

[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.

need for manual underwriting reviews. Since May 2004, HUD requires lenders submit borrowers credit scores. In July 2008, all loans are required to be submitted through FHA's TOTAL scorecard.

**4. Changes in Mortgage Insurance Premiums**

In response to the low capital ratio observed in FY 2009, 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.[3]

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 increases the limit of annual mortgage insurance premium that HUD is authorized to charge. Starting October 4, 2010,[4] the upfront premium was reduced to 1.00 percent for all mortgage types, but the annual premium for loans with 30-year terms was increased to 85 basis points if the LTV ratio is less than or equal to 95 percent and to 90 basis points if the LTV ratio exceeds 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 originated after April 4, 2011.[5]

**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)[6] conforming loan limit of $417,000, nor be lower than 65 percent of the same 2008 GSE conforming loan limit for a residence of applicable size. FHA's single-family national loan limit ceiling for 2008 was revised to $729,750. These loan limit increases are effective for mortgages endorsed for FHA insurance on or after March 6, 2008.[7]

Under HERA of 2008, 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

[3] Mortgagee Letter 2010-02, January 21, 2010: Increase in Upfront Premiums for FHA Mortgage Insurance.
[4] Mortgagee Letter 2010-28, September 1, 2010: Changes to FHA Mortgage Insurance Premiums.
[5] Mortgagee Letter 2011-10, February 14, 2011: Annual Mortgage Insurance Premium Changes and Guidance on Case Numbers.
[6] The GSEs are Fannie Mae, Freddie Mac, and the Federal Home Loan Banks.
[7] Mortgagee Letter 2008-06, March 6, 2008, Temporary Loan Limit Increase for FHA.

$417,000. Effective January 1, 2009, 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.[8]

In February 2009, FHA single family loan limits changed as a result of the American Recovery and Reinvestment Act of 2009 (ARRA), which was signed into law on February 17, 2009. These limits were effective for those loans for which the credit was approved in calendar year 2009.[9] 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.[10] Since both the ESA and HERA set the FHA national loan limit floor at 65 percent, the FHA loan limit floor also remains at the FY 2009 level, $271,050. For the FHA national loan limit ceiling, the limit based on ESA (175 percent) is higher than that based on HERA (150 percent), and the national loan limit ceiling is $729,750, which is again the same as in the previous year.

### 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. The percentage still exceeded fifteen percent in FY 2008. FHA guidelines allowed such borrowers to use outright gifts of cash as downpayment assistance. 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. 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.[11] 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 in FY 2009 and are virtually non-existent in FY 2010 and FY 2011. The elimination of seller-financed downpayment assistance will have a significant effect in reducing losses on future FHA books, as previous Actuarial Reviews have quantified.

[8] Mortgagee Letter 2008-36, November 7, 2008, 2009 FHA Maximum Mortgage Limits.
[9] Mortgagee Letter 2009-07, February 24, 2009 Loan Limit Increases for FHA.
[10] Mortgagee Letter 2010-40, December 1, 2010: 2011 FHA Maximum Loan Limits.
[11] "Mortgage Finance Additional Action Needed to Manage Risks of FHA-Insured Loans with Downpayment Assistance," Government Accountability Office, November 2005.

**7. Foreclosure Avoidance and Loss Mitigation Program**

One of the consequences of the severe housing recession is 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,[12] 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.[13] This approach has the benefit of reducing the total foreclosure 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.[14] This loss mitigation proved to be an effective way of keeping financially stressed borrowers in their homes and reducing the loss severity rate of defaulted loans. The implementation of loss mitigation tools ramped up quickly and became a significant part of FHA's risk management practice 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 and provided FHA with additional loss mitigation authority to assist FHA mortgagors under 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 homeowners in default an opportunity to reduce their mortgage payments to a sustainable level. 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.

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 will give a greater number of responsible borrowers an opportunity to remain in their homes.[15] 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 mortgage to qualify for an FHA refinance loan provided that the lender or investor writes off the unpaid principal balance of the original first lien mortgage by at least 10 percent.

[12] The regulations for the PFS Program are codified in 24 CFR 203.370.
[13] Mortgagee Letter 2008-43, December 24, 2008, Utilizing the PFS Loss Mitigation Option.
[14] 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.
[15] Mortgagee Letter 2010-23, August 6, 2010, FHA Refinance of Borrowers in Negative Equity Positions.

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

## C. Current and Future Market Environment

### 1. Interest Rates

Due to the current weak economy and the Fed's active monetary policies, one-year Treasury interest rates have fallen to a historically low level: from 2.18 percent in Aug 2008 to 0.46 percent in Aug 2009, to 0.26 percent in Aug 2010, and to 0.11 percent in Aug 2011. Similarly, looking back two years, the ten-year Treasury yield also declined from 3.59 percent in Aug 2009 to 2.00 percent in Aug 2011. The average conventional 30-year fixed-rate mortgage commitment rate posted by Freddie Mac also declined from 5.19 percent in Aug 2009 to 4.27 percent in Aug 2011. These actual rates in 2011 were much lower than those that were projected and used in last year's Review.

Based on the July 2011 economic forecasts by Moody's Analytics, which is used for this year's Review, future mortgage rates will steadily rise to 7.31 percent by 2013Q2 and stabilize around 6.60 percent afterward. The one-year Treasury rates will rise to 1.78 percent by 2013Q2, and the ten-year Treasury rates will rise to 5.87 percent by 2013Q2. The Moody's July 2011 forecasted rates for one-year Treasury rates are lower than their July 2010 forecast, but the ten-year Treasury rates and the mortgage rates are generally higher than those in the July 2010 forecast.

In a press release on August 9, 2011, the Federal Reserve Board announced its intention to keep the federal funds rate low for the next two years. Later, on September 21, it announced the plan to invest $400 billion in long-term Treasury securities over the next nine months in an attempt to drive down interest rates on mortgage loans, corporate bonds and other forms of credit. These most recent policies indicate that the interest rates may remain low for an extended time period. These announcements came after the analyses of this report had been completed. Although the base case scenario analysis assumes rapid rising interest rates, we do include a sensitive analysis to assess the possible results under a sustained low interest rate environment.

### 2. House Price Growth Rates

Projections for future house price growth rates are based on the Moody's July 2011 forecasts of FHFA house price indices. Moody's house price forecasts are used primarily to take advantage of their capacity to provide house price index forecasts at the local level, including metropolitan, state, and national levels. 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 having various probabilities of occurrence

and representing varying degrees of economic improvement or deterioration relative to the base-case.

The realized national FHFA house price growth rates have been negative since 2007:Q3 (measured quarterly year over year). The national growth rates reached a trough of negative 5.7 percent in 2008:Q4 before the index roughly flat-lined during the second half of 2010. However, in 2011:Q1 the growth rate was negative 2.67 percent (annualized), indicating renewed near-term weakness in the housing market.

Regarding the projection period of this Review and taking into account the MSA concentrations of FHA's insurance portfolio, the house price growth rate forecasts by Moody's in July 2011 are lower in the short-term compared to their July 2010 forecasts; however they are higher in FY 2013 and beyond. Moody's July 2011 forecast predicts a return to positive home price growth of 1.21 percent in FY 2012 and peaking at 6.08 percent in FY 2014 before settling between 3 and 4 percent in FY 2018 and beyond.

**3. Mortgage Demand**

FHA's market share has increased dramatically since dropping to a low of 2.4 percent in FY 2007. FHA's market share generally declined in concert with the expansion of the subprime mortgage market since 2002. After the financial crisis of 2008, the subprime mortgage market has become moribund and private mortgage insurers continue to face heavy losses so their appetite for new insurance business is capital-constrained. Thus, FHA has become a primary source of high LTV lending, with a share of 18 percent of the entire single-family first-lien mortgage market during the past two years. The Fund origination volume during FY 2009 reached $330 billion, up from $176 billion in FY 2008. The FY 2010 volume was $288 billion and the volume estimated for FY 2011 is $217 billion.[16]

We believe that 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 in the markets and to the same extent, FHA market share will likely revert to its historical norm of around 8 to 10 percent. Otherwise, with an assumed prolonged impairment, we project the FHA market share to settle 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 the future level of interest rates. Moody's July 2011 base-case scenario projects negative near-term house price growth at the national level. In addition, it projects a near-term rapid rise in mortgage rates. These factors lead us to estimate a reduction of FHA volume to $153 billion in

[16] Based on FHA data warehouse as of the end of August 2011.

FY 2012. We then expect FHA endorsement volume to rebound to the $200 billion range for FY 2015 and beyond.

### 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 2010 Actuarial Review** – presents the Fund's estimated economic value and insurance-in-force for FY 2011 through FY 2018. This section also provides a reconciliation and explanation of the major differences between the FY 2010 and the FY 2011 Reviews concerning the key variables.

**Section III. Current Status of the MMI Fund** – presents the estimated economic value and IIF for the Fund at the end of FY 2011 and provides an analysis of the performance of the FY 1982 through FY 2011 books of business.

**Section IV. Characteristics of the Fiscal Year 2011 Insurance Portfolio** – describes the FY 2011 insurance portfolio and compares the risk characteristics of the origination books of business across historical fiscal years.

**Section V. Sensitivity of the Fund Performance under Alternative Scenarios** – presents sensitivity analyses of the Fund using a range of alternative economic assumptions.

**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 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 the development of our econometric model used for forecasting future FHA loan volumes.

**Appendix G. Historical and Projected Loan Termination Rates** – contains claim and prepayment rates historically and projected by the forecasting system.

## Section II: Summary of Findings and Comparison with FY 2010 Actuarial Review

This section presents the economic value and insurance in force of the Fund[17] for FY 2011 and provides an explanation of how the economic values of this year's Review compare with those of the FY 2010 Review.

### A. The FY 2011 Actuarial Review

This FY 2011 Actuarial Review estimates the economic value of the Fund as of the end of FY 2011 (September 30, 2011) and projects the status of the Fund through FY 2018. 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 losses and projecting future 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 using this data, and using these models and independent forecasts of future macroeconomic conditions published by Moody's Analytics to project the future cash flows of the Fund. These future cash flows were discounted back to FY 2011 and were combined with the capital resources to estimate the economic value of the Fund.

The econometric models are similar in many respects to those of the FY 2010 Review, but with some major enhancements implemented for the current Review. One major model enhancement implemented this year is the incorporation of prior delinquency-cure events into the status transition equations. In addition to tracking the transition from current to 90-day delinquent and from 90-day delinquent to (1) cure, (2) prepay, or (3) claim, the models now also differentiate between loans that are in their first delinquent episode and loans that had been previously delinquent but subsequently have cured. In addition, transitions from 90-day delinquent to cure are differentiated by whether they are (1) self-cures, (2) cures involving loan modification or other partial claim actions, or (3) cures involving other non-modification forms of loss mitigation, such as repayment plans or forbearance.

[17] 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 among the most stressful regions. The loan-level status transition data during the recent severe house price declines made possible the estimation of the model coefficients in the more stressful regions. These refined coefficient estimates are shown to be particularly important in the sensitivity analyses.

The estimation of the loan status transition models utilizes loan-level data on the Fund's experience reported by HUD beginning in FY 1990 and extending through the second quarter of FY 2011 (March 2011).

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

- As of the end of FY 2011, the Fund is projected to have an estimated economic value of **$1.19 billion**, an unamortized insurance-in-force of **$1,069.35 billion**, and an amortized insurance-in-force of **$1,009.15 billion**.

- The FY 2011 book of business is projected to contribute an estimated **$10.55 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 $8.32 billion per year through FY 2018. With the expected slower prepayment rates of the existing books of business implied by the rapidly rising interest rate environment, along with the continuation of high FHA market share, the IIF will increase by an average rate of 6.28 percent per year through FY 2018. 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 2018. In summary, the economic value is projected to steadily increase over the next 7 years to reach $59.45 billion by the end of FY 2018.

**Exhibit II-1**

| Projected Fund Performance for FY 2011 to FY 2018 ($ 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** |
| 2011 | 1,193 | 1,069,354 | 1,009,153 | 10,549 | 219,402 | |
| 2012 | 9,351 | 1,131,977 | 1,057,880 | 8,152 | 153,923 | 7 |
| 2013 | 15,637 | 1,185,849 | 1,096,849 | 6,093 | 136,430 | 193 |
| 2014 | 23,500 | 1,262,510 | 1,157,012 | 7,446 | 166,753 | 417 |
| 2015 | 32,515 | 1,376,174 | 1,252,132 | 8,345 | 206,430 | 670 |
| 2016 | 41,134 | 1,518,917 | 1,375,996 | 7,657 | 199,156 | 962 |
| 2017 | 49,865 | 1,556,638 | 1,393,483 | 7,268 | 193,575 | 1,463 |
| 2018 | 59,448 | 1,637,984 | 1,452,944 | 7,478 | 199,247 | 2,105 |

[a] All values are as of the end of each fiscal year. The economic value for future years (FY 2012 through FY 2018) 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, 2011 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 2010 and FY 2011 Reviews. The FY 2010 Review estimated that the Fund had $5.16 billion in economic value at the end of FY 2010 to cover future unexpected claim losses.

FHA estimated that the Fund has total capital resources of $28.18 billion at the end of FY 2011. The present value of future cash flows is estimated to be *negative* $26.99 billion. Thus, as of the end of FY 2011, the Fund is projected to have $1.19 billion in economic value that can be used to cover unanticipated future claim losses on the existing portfolio.

**Exhibit II-2**

| Estimates of Fund Economic Value as End of FY 2011 ($ Millions) | | |
|---|---|---|
| **Item** | **End of FY 2010[a]** | **End of FY 2011** |
| Cash | $ 26,309 | |
| Investments | 4,128 | |
| Properties and Mortgages | 3,292 | |
| Other Assets and Receivables | 12 | |
| Total Assets | $ 33,741 | |
| Liabilities | (2,940) | |
| Total Capital Resources | $ 30,801 | |
| Net Gain from Investments | | 1,139[b] |
| Net Insurance Income in FY 2011 | | (2,440)[c] |
| Net Change in Properties and Mortgages | | (868)[b] |
| Net Change in Accounts Payable | | 85[b] |
| Transfer to HECM Account | | (535)[b] |
| **Total Capital Resources** | | **28,183** |
| PV of Future Cash Flows on Outstanding Business | | (26,990) |
| **Economic Value** | **$ 5,160[d]** | **1,193** |
| Unamortized Insurance-In-Force | 926,251[d] | 1,069,354 |
| Amortized Insurance-In-Force | 879,875[d] | 1,009,154 |

[a] Source: Audited Financial Statements for FY 2010.
[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 2011 provided by FHA and projected net cash flow for the remaining two months
[d] From the FY 2010 Actuarial Review.

As seen in Exhibit II-2, the estimated FY 2011 economic value of the Fund decreased 76.88 percent from the FY 2010 level reported in last year's Review – from $5.16 billion to $1.19 billion. The IIF increased by 15.45 percent – from $926.25 billion to $1,069.35 billion. The increase in IIF is mainly due to the high endorsement volume in FY 2011. On the other hand, the change in estimated economic value represents the net impact of several significant factors, which are described in detail below.

## C. Sources of Change from the FY 2010 Review to the FY 2011 Review

This section describes the sources of change in estimates between the FY 2010 Review and the FY 2011 Review for the FY 2011 and FY 2017 economic values. 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. However, this section presents an approximate decomposition of differences in the FY 2011 and FY 2017 economic values from those presented in the FY 2010 Review, by source of change.

### 1. Change in Economic Value from FY 2010 to FY 2011

The FY 2010 Review estimated the economic value of the Fund as of the end of FY 2010 to be $5.16 billion, and the projected FY 2017 economic value to be $39.58 billion. In this Review, we estimate the end-of-FY 2011 economic value for the Fund to be $1.19 billion, which represents a decrease of $3.97 billion from the FY 2010 economic value reported in the FY 2010 Review. This is a 76.88 percent decrease in the estimated economic value of the Fund. Accompanying this decrease in economic value is an increase in the unamortized IIF of 15.45 percent due primarily to the high endorsement volume in FY 2011.

### 2. Current Estimate of FY 2011 Economic Value Compared with the Estimate Presented in the FY 2010 Actuarial Review

The FY 2010 Review projected that the FY 2011 investment earnings on Fund balances and the present value of the FY 2011 book of business would add $0.07 billion and $5.74 billion, respectively, to the economic value of the Fund, resulting in a projected FY 2011 economic value of $10.97 billion. As shown in Exhibit II-2, with the updated financial statements and data extract we now observe the end-of-FY 2010 capital resources to be $30.80 billion and estimate the net sources/uses of funds in FY 2011 to be *negative* $2.62 billion, thus the estimated end-of-FY 2011 capital resources is $28.18 billion. Details on net income in FY 2011 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* $26.99 billion, this year's estimate of the FY 2011 economic value is $1.19 billion. Thus, this year's estimate of the FY 2011 economic value is $9.78 billion lower than the economic value of $10.97 billion projected for FY 2011 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 2011 and 2017 from the FY 2010 Review as compared to the FY 2011 Review. The overall net change in economic value, reflecting several offsetting factors, is negative for FY 2011 but is positive for FY 2017.

**Exhibit II-3**

| Summary of Changes in Fund Estimated Economic Value Between FY 2010 and FY 2011 ($ Millions) | | | | |
|---|---|---|---|---|
| | **Change in FY 2011 Economic Value** | **FY 2011 Economic Value[a]** | **Change in FY 2017 Economic Value** | **Corresponding FY 2017 Economic Value[b]** |
| FY 2010 Economic Value Presented in the FY 2010 Review | | $5,160 | | |
| FY 2011 Economic Value Presented in the FY 2010 Review, Excluding the FY 2011 Book of Business: | $68 | $5,228 | | |
| Plus: Forecasted Economic Value of FY 2011 Book of Business Presented in the FY 2010 Review | $5,741 | | | |
| Equals: FY 2011 Economic Value Presented in the FY 2010 Actuarial Review | | **$10,969** | | **$39,582** |
| Plus: a. Fund transfer to HECM account | -$534 | $10,435 | -$688 | $38,894 |
| Plus: b. Update volume of FY 2010-2011 books | -$1,332 | $9,103 | -$1,716 | $37,178 |
| Plus: c. Update volume forecast of FY 2012 and later books | $0 | $9,103 | -$9,628 | $27,550 |
| Plus: d. Update Moody's economic forecast | +$2,101 | $11,204 | +$11,692 | $39,242 |
| Plus: e. Update actual performance in FY 2010-2011 and IIF as of end of FY 2011 | -$2,539 | $8,665 | -$3,271 | $35,971 |
| Plus: f. Update econometric model and portfolio status | -$5,996 | $2,669 | +$3,152 | $39,123 |
| Plus: g. update loss rate and loss mitigation expense models | +$240 | $2,909 | +$155 | $39,278 |
| Plus: h. Update OMB discount factors | -$1,302 | $1,607 | -$2,535 | $36,743 |
| Plus: i. Apply new insurance premium schedule | +1,368 | $2,975 | +$15,182 | $51,925 |
| Plus: j. Special adjustment for foreclosed loans | -$1,782 | $1,193 | -$2,060 | $49,865 |
| Equals: Estimate of Economic Value | **-$9,776** | **$1,193** | **+$10,283** | **$49,865** |

[a] Shows the progression of economic values as the end of FY 2011 as incremental changes are made.
[b] The FY 2017 economic values are the latest year that can be directly compared between the FY 2010 and FY 2011 Reviews.

### 3. Decomposition of the Differences in Economic Value of the Current Review versus the FY 2010 Review

We now present a step-by-step analysis of the differences in the FY 2010 and FY 2011 Reviews, shown in Exhibit II-3.

#### a. Fund Transfer to HECM Account

In May 2011, an amount of $0.53 billion was transferred from the MMI reserve account into HECM's financing account to cover the increase in expected losses identified by the annual budget re-estimation. The amount is explicitly reserved for HECMs and is no longer available to cover unexpected losses of the non-HECM portfolio. As a result, the FY 2011 economic value is lowered by $0.53 billion.

#### b. Update Origination Volume of FY 2010 and FY 2011

The second component of change depicted in Exhibit II-3 relates to the updated origination volume and composition for the FY 2010 and FY 2011 books of business. The actual realized origination volume of the FY 2010 book and updated estimate of the FY 2011 book as of September 2011 are smaller than what were projected in last year's Review. The smaller realized volume caused a decrease of $1.33 billion in the FY 2011 economic value. The projected economic value due to the updated volume and composition projections through FY 2017 were also lower.

#### c. Update Volume Forecast of FY 2012 and Later Books of Business

The third element of change in Exhibit II-3 is the change in the lower FHA endorsement volume of FY 2012 and later books of business. This step has no impact to the FY 2011 economic value, but has a substantial impact on the FY 2017 economic value of lowering by $9.63 billion.

#### d. Update Economic Forecasts

Compared to its July 2010 forecast, Moody's Analytics' July 2011 local house price growth rate forecast is more pessimistic in the short run, but more optimistic in the long run. Specifically, the recent housing recession is extended one more year to last until the 3rd quarter of FY 2012. After that, the average forecasted local house price growth rates become higher than those of last year's forecast. On net, the longer-term stronger house price growth rates have the stronger impact and caused the FY 2011 economic values to increase by $2.10 billion. Because the weaker housing market during FY 2011 has no direct impact on FY 2012 and later endorsements, the net positive effect is even stronger on the FY 2017 economic value, which increases by $11.69 billion.

**e. Update Insurance in Force as of End of FY 2011**

The mortgage industry continued its tight underwriting operation throughout FY 2011. This leads to low prepayment rates. With the low prepayment rates, there is a higher volume of loans outstanding as of the end of FY 2011. Since the higher upfront premiums of these loans were already accounted in the capital resources, they have large negative expected cash flows in their remaining life. A larger balance directly translates into more negative present values. This larger balance of insurance in force resulted in a $2.54 billion lower FY 2011 economic value.

**f. Update Econometric Model and Portfolio Status**

As a result of our continuing effort to improve the accuracy of the analysis, several major model enhancements were implemented this year. The most important change is the elimination of the dependence on policy dummy variables. In last year's model, we included several policy year dummy variables to capture the change in market regimes, such as the change in loss-mitigation policies, subprime market disruption, and the credit tightening after the housing bubble burst. Eliminating the policy year dummies assumes that the future market will be a mix of these different market regimes. On the other hand, last year's model assumed that the long term market environment would be similar to the one prevailing during fiscal years 2002 and 2003, which had high prepayment rates. Under the new model, the prepayment rate forecast would follow a mix of a much longer history, including the past few years of credit market tightening. As a result, the prepayment rates estimated by this year's model are much lower than those of last year. The slower prepayment rate has opposite impacts on older compared to newer books of business. For FY 2010 and older loans, with 0.5 percent annual premiums, the present value of future cash flows tends to be negative. The lower prepayment rate indicates the cash flow stream will last longer and generate more negative present value. For FY 2011 and later books, the updated annual premiums approximately doubled the previous level. The elimination of the policy year dummy variables also shifted performance sensitivity of the loans to dynamic economic variables, making this year's model more sensitive to future economic variations. When the prepayment rate slows down, the higher annual premiums will bring higher present value for these newer books of business. Thus, the lower prepayment rate contributes to a decrease in FY 2011 economic value but to an increase in FY 2017 economic value.

Another main change of this year's model is that the status transition model has been enhanced to capture the different behavior between loans with no prior 90-day delinquencies and those with prior 90-day delinquencies that were subsequently cured. This change requires a different process in extracting loan status from historical default records. The worse than expected house price performance in FY 2011 worsened the distribution of the existing portfolio's delinquent statuses compared to last year's forecast, leading to a decrease in economic value for FY 2010 and prior books of business. On the other hand, it has virtually no impact to the FY 2011 and later endorsements.

Both of the above effects lead to lower FY 2011 economic value while increasing FY 2017 economic value. However, due to the different data processing requirement, it is infeasible to further decompose these two main drivers of model change. These and other modeling changes led to a decrease in estimated economic value in FY 2011 by $6.00 billion, and an increase in estimated economic value of $3.15 billion in FY 2017.

**g. Update Loss Rate Models**

A dynamic loss severity rate model that varies with characteristics of claimed loans was developed and implemented in the FY 2009 Review. The model coefficients were re-estimated this year using updated data. An additional variable was added to the model to capture whether deficiency judgments are allowed in the state. The loss rate model now also captures the loss to the Fund due to the expenses associated with loss mitigation cases, which was estimated to be approximately 7.2 percent of the annual loss associated with claim cases. The update of the loss rate model causes the FY 2011 and FY 2017 economic values to increase by $0.24 billion and $0.16 billion, respectively.

**h. Update FY 2012 OMB 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, similar to last year. Updating the discounting factors cause the FY 2011 economic value to decrease by $1.30 billion. Since the implied forward rates are slightly higher than those used last year, the FY 2017 economic value decreases by $2.54 billion.

**i. Premium Changes in FY 2011**

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 announced[18] that for loans for which a case number is assigned on or after October 4, 2010, the upfront premium will be reduced to 1.00 percent for all mortgage types, but the annual premium for loans with 30-year terms will be increased to 85 basis points if the LTV ratio is less than or equal to 95 percent and to 90 basis points if the LTV ratio exceeds 95 percent. For loans with 15-year terms, an annual premium of 25 basis points will be charged if the LTV is higher than 90 percent. Also FHA announced[19] that for loans with

[18] Mortgagee Letter 2010-28, September 2010, Changes to FHA Mortgage Insurance Premiums.
[19] Mortgagee Letter 2011-10, February 2011, Annual Mortgage Insurance Premiums Changes and Guidance on Case Numbers.

case numbers assigned on or after April 18, 2011, the annual mortgage insurance premium was increased by another 25 basis points for all mortgage types. .

These changes in mortgage insurance premiums are imposed on all loans originated in FY 2011 and later. The new annual mortgage premium structure led to an increase in the FY 2011 economic value of $1.37 billion and an increase in the FY 2017 economic value of $15.18 billion.

**j. Adjustments for Foreclosed Loans**

As of the end of July 2011, FHA provided us a list of an unusually large number of loans that are in the foreclosure process. Many had already held foreclosure sales or even completed the foreclosure process several months prior, but the servicers had not yet filed claims. It is possible that some servicers are taking extra caution in the foreclosure and claim process in order to ensure that the claims will not be denied for any procedure-related defects. Under the current stressed housing market, it is most likely that the loans that have already gone through the foreclosure process will eventually file claim losses against the MMI Fund. The delay in the claims from these loans led to higher capital resource in the MMI Fund as of end of FY 2011. However, as these claims eventually get filed, the claim rates during FY 2012 are likely to be higher than the model's projection, causing the present value of future cash flows to be more negative and leading to a reduction in the economic value of the Fund.

Detailed FHA foreclosure timing data indicate that 86 percent of loans with a completed foreclosure have a claim within one year, and 93 percent of such loans have a claim within two years. As of July 2011, the number of completed foreclosures pending a claim was 28,339, which is 21,444 more than the historical average. We assume that 90 percent of this extra inventory will be claimed during FY 2012, equivalent to 19,299 loans. This is about 70 percent of the number of outstanding loans with foreclosure completed after FY 2007 (27,626).

The number of foreclosure sales held during FY 2008 and FY 2009 averaged 20,355 loans. The outstanding number of foreclosure sales held but not yet completed as of July 2011 was 33,369 loans, indicating that 13,014 more loans than typical remained in inventory. Applying the same 90 percent expected claim rate within the next year, 11,713 loans will be claimed during FY 2012. This is about 35.3 percent of the number of outstanding loans with foreclosure sales held after FY 2007 but not yet completed. Based on the above analysis, we made the following assumptions: (1) 70 percent of the loans that had a foreclosure completion are assumed to be claimed in FY 2012 and (2) 35 percent of the loans with a foreclosure sale held but not yet completed are assumed to be claimed in FY 2012. The remaining portions of these loans are analyzed using the standard performance simulation model.

The assumptions about delayed claims lead to a $1.78 billion reduction in FY 2011's economic value and a $2.06 billion reduction in FY 2017's economic value.

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## Section III: Current Status of the MMI Fund[20]

As of the end of FY 2011, the Fund has an estimated economic value of $1.19 billion. The estimated economic value at the end of FY 2010 was $5.16 billion. The current estimated economic value is $3.97 billion lower than what it was at the end of FY 2010, and lower than the $10.97 billion projected FY 2011 economic value presented in the FY 2010 Review. At the same time, the unamortized IIF of the Fund increased 15. 5 percent, from $926.25 billion in FY 2010 to $1,069.35 billion in FY 2011, due to the high endorsement volume of the FY 2011 book of business and the low prepayment rate experienced during FY 2011.

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 2011 and the projected future performance of new books of business through FY 2018. This section describes the basic components of the Fund's economic value and how they are expected to change through FY 2018.

### A. Estimating 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 2011, plus the present value of expected future cash flows of the existing loan portfolio as estimated by our financial models.

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 mortgage origination date to the year of the scheduled maturity (*e.g.*, 30 years for 30-year mortgages).

#### 1. Capital Resources

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.

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

Exhibit III-1 indicates that the Fund's audited capital resources at the end of FY 2010 was $30.80 billion.

The next step in estimating the capital resources as of the end of FY 2011 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 $1.14 billion for FY 2011. (2) Net insurance cash flow: FY 2011 net insurance cash flow was estimated by combining FHA's reported net cash flow for the period from October 2010 through July 2011 with our model-projected August and September 2011 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, the last three being negative cash flows. The resulting insurance-related cash flow for FY 2011 was estimated to be *negative* $2.44 billion. (3) Change in real estate owned (REO) inventory: FHA estimates that its REO inventory decreased by $0.87 billion in FY 2011. (4) An estimated net change in accounts payable of $0.09 billion. (5) A cash transfer to HECM: an amount of $0.54 billion was transferred from the MMI reserve account into HECM's financing account to cover the expected losses identified by the annual budget re-estimation in May 2011. The net adjustment of these five factors is the change in capital resources for the year of *negative* $2.62 billion. As a result, the capital resources of the Fund as of the end of FY 2011 were estimated to be $28.18 billion.

**Exhibit III-1**

| Estimates of Fund Economic Value as End of FY 2011 ($ Millions) | | |
|---|---|---|
| **Item** | **End of FY 2010[a]** | **End of FY 2011** |
| Cash | $ 26,309 | |
| Investments | 4,128 | |
| Properties and Mortgages | 3,292 | |
| Other Assets and Receivables | 12 | |
| Total Assets | $ 33,741 | |
| Liabilities | (2,940) | |
| Total Capital Resources | $ 30,801 | |
| Net Gain from Investments | | 1,139 [b] |
| Net Insurance Income in FY 2011 | | (2,440)[c] |
| Net Change in Properties and Mortgages | | (868)[b] |
| Net Change in Accounts Payable | | 85[b] |
| Transfer to HECM Account | | (535)[b] |
| **Total Capital Resources** | | **28,183** |
| PV of Future Cash Flows on Outstanding Business | | (26,990) |
| **Economic Value** | **$ 5,160[d]** | **1,193** |
| Unamortized Insurance-In-Force | 926,251[d] | 1,069,354 |
| Amortized Insurance-In-Force | 879,875[d] | 1,009,154 |

[a] Source: Audited Financial Statements for FY 2010.
[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 2011 provided by FHA and projected net cash flow for the remaining two months
[d] From the FY 2010 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 1982 through the FY 2011 books of business that have survived to the end of FY 2011. The present values are computed from the projected cash flows occurring during FY 2012 and future years. 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 2011. From Exhibit III-2, the total present value of these future cash flows is *negative* $26.99 billion. Compared to the corresponding figure estimated in the FY 2010 Review for books through FY 2010, the current liability is increased by $1.60 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 2008 will 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 if the economy follows the Moody's July 2011 forecast both the FY 2008 and FY 2009 books will experience the largest negative present values of any book, *negative* $10.94 billion and *negative* $8.93 billion, respectively.

**Exhibit III-2**

| Present Value of Future Cash Flows as of the End of FY 2011 By Origination Fiscal Year & Mortgage Type ($ Millions) | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **FRM 30** | **FRM 15** | **ARM** | **SR 30** | **SR 15** | **SR ARM** | **Total** |
| 1982 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1983 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 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 | -3 |
| 1989 | -4 | 0 | 0 | 0 | 0 | 0 | -4 |
| 1990 | -7 | 0 | 0 | 0 | 0 | 0 | -7 |
| 1991 | -9 | 0 | 0 | 0 | 0 | 0 | -9 |
| 1992 | -11 | 0 | -1 | 0 | 0 | 0 | -12 |
| 1993 | 5 | 0 | 2 | -2 | 0 | 0 | 6 |
| 1994 | 8 | 0 | 3 | -3 | 0 | 0 | 7 |
| 1995 | -1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 1996 | -6 | 0 | -1 | -1 | 0 | 0 | -9 |
| 1997 | -17 | 0 | -3 | -1 | 0 | 0 | -22 |
| 1998 | -36 | 0 | -4 | -5 | 0 | 0 | -45 |
| 1999 | -82 | 0 | -3 | -12 | 0 | -1 | -98 |
| 2000 | -147 | 0 | -11 | -2 | 0 | -1 | -160 |
| 2001 | -383 | 0 | -7 | -32 | 0 | -2 | -424 |
| 2002 | -640 | -1 | -44 | -61 | -1 | -11 | -758 |
| 2003 | -1,211 | -3 | -54 | -313 | -3 | -21 | -1,605 |
| 2004 | -1,690 | -4 | -146 | -236 | -3 | -49 | -2,128 |
| 2005 | -1,224 | -6 | -198 | -165 | -2 | -36 | -1,630 |
| 2006 | -2,093 | -11 | -85 | -109 | -1 | -4 | -2,303 |
| 2007 | -3,681 | -21 | -70 | -168 | -1 | -3 | -3,944 |
| 2008 | -9,891 | -77 | -219 | -714 | -3 | -32 | -10,936 |
| 2009 | -5,416 | -83 | -133 | -3,168 | -11 | -118 | -8,929 |
| 2010 | 516 | -56 | -281 | -1,032 | -6 | -245 | -1,105 |
| 2011[a] | 6,581 | -31 | 57 | 587 | 1 | -59 | 7,135 |
| Total[b] | -19,450 | -293 | -1,199 | -5,437 | -30 | -582 | -26,990 |

[a] Based on projected volume as of August 2010 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 estimated in this Review to permit HUD to combine the results of this Review with the separate HECM analysis in computing the MMI Fund capital ratio. Exhibit III-3 shows the total volume of new mortgage endorsements for each book of business, and the unamortized IIF and the amortized IIF as of the end of FY 2011.

As can be inferred from Exhibit III-3, the FY 2009, FY 2010, and FY 2011 books of business constitute approximately 24.57, 26.71 and 21.17 percent of the Fund's total end of FY 2011 amortized IIF, respectively. Mortgage endorsements declined significantly after FY 2003 as the subprime market expanded. FHA endorsements, however, have subsequently 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. Because over 51 percent of the entire Fund is now concentrated in mortgages originated in FY 2009 and FY 2010, the Fund is expected to realize high claim losses during FY 2012 through FY 2015 as the surviving loans from these books of business enter their peak default periods.

The endorsement volume of the FY 2011 book remains relatively high, making it the third largest book in FHA history after the peak volumes endorsed in FY 2009 and FY 2010. This most recent book has the best credit quality composition among all books and higher annual insurance premium rates. Meanwhile, as the housing market is forecasted to move slowly out of its worst period, this book of business is forecasted to generate a positive $10.55 billion economic value to the Fund as shown in Exhibit II-1 (including the upfront insurance premiums).

**Exhibit III-3**

| Endorsements and Insurance-in-Force of the Fund As of End of FY 2011 (in $ Millions) | | | |
|---|---|---|---|
| **Book of Business[a]** | **Mortgage Endorsements** | **Unamortized Insurance in Force[b]** | **Amortized Insurance in Force[b]** |
| 1982 | 7,317 | 230 | 21 |
| 1983 | 26,819 | 844 | 148 |
| 1984 | 15,931 | 438 | 117 |
| 1985 | 24,086 | 535 | 191 |
| 1986 | 57,747 | 1,700 | 652 |
| 1987 | 70,230 | 2,395 | 977 |
| 1988 | 37,433 | 1,122 | 541 |
| 1989 | 39,764 | 1,090 | 583 |
| 1990 | 47,127 | 1,173 | 668 |
| 1991 | 44,067 | 1,106 | 669 |
| 1992 | 45,093 | 1,557 | 946 |
| 1993 | 73,799 | 2,719 | 1,703 |
| 1994 | 79,692 | 3,866 | 2,491 |
| 1995 | 41,534 | 1,637 | 1,155 |
| 1996 | 61,696 | 2,704 | 1,975 |
| 1997 | 65,469 | 2,956 | 2,186 |
| 1998 | 88,593 | 5,300 | 3,989 |
| 1999 | 110,067 | 8,252 | 6,330 |
| 2000 | 86,805 | 4,211 | 3,463 |
| 2001 | 119,891 | 7,859 | 6,569 |
| 2002 | 128,891 | 13,755 | 11,490 |
| 2003 | 150,582 | 35,539 | 29,876 |
| 2004 | 92,897 | 30,333 | 26,249 |
| 2005 | 57,710 | 28,977 | 25,822 |
| 2006 | 50,135 | 26,954 | 24,758 |
| 2007 | 57,669 | 31,707 | 29,773 |
| 2008 | 176,095 | 99,407 | 94,670 |
| 2009 | 329,747 | 257,987 | 247,942 |
| 2010 | 290,031 | 276,916 | 269,573 |
| 2011[c] | 219,402 | 216,087 | 213,627 |
| Total[d] | 2,696,319 | 1,069,354 | 1,009,154 |

[a] End of year insurance-in-force

[b] Based on March 30, 2011 data extract from HUD and the performance of outstanding loans projected by the econometric models for the fiscal year 2011

[c] Based on HUD's August 2011 projection.

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

## B. Projected Future Economic Values

In this section the economic value of the Fund is projected over the FY 2012 to FY 2018 period based on: (a) our volume time-series regression model, (b) FHA's forecast of future endorsement composition, (c) Moody's economic forecasts, and (d) cash flow projections based on the econometric and cash flow models. The initial economic values of individual future books of business are first projected, and then 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 2018) are presented in Exhibit III-4. Note that these are all positive. Due to curtailed private mortgage lending activities, FHA has become a primary source of housing finance, including those with lower LTVs and higher credit scores. With reduced competition from the private market, FHA projects that the credit quality of the FY 2012 mortgages will continue to be better than the historical average. At the same time, insurance premiums are scheduled to be high relative to their historic levels. The high-claim-rate downpayment assistance loans have diminished since FY 2009 and are now 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[a] by Origination Year & Mortgage Type (in $ Millions) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Fiscal Year** | **FRM 30** | **FRM 15** | **ARM** | **SR 30** | **SR 15** | **SR ARM** | **Total** |
| 2012 | 7,494 | 123 | 188 | 337 | 3 | 8 | 8,152 |
| 2013 | 5,807 | 89 | 166 | 29 | 0 | 1 | 6,093 |
| 2014 | 6,952 | 81 | 172 | 230 | 2 | 9 | 7,446 |
| 2015 | 7,268 | 60 | 171 | 806 | 7 | 33 | 8,345 |
| 2016 | 6,572 | 55 | 159 | 829 | 8 | 34 | 7,657 |
| 2017 | 6,394 | 54 | 156 | 633 | 6 | 25 | 7,268 |
| 2018 | 6,549 | 62 | 158 | 675 | 7 | 26 | 7,478 |

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

## Section IV: Characteristics of the Fiscal Year 2011 Insurance Portfolio

This section analyzes the characteristics of the loan portfolio insured by the Fund[21] at the end of FY 2011. The characteristic descriptions cover the following three areas: (1) analysis of the volume and composition of loan originations, (2) comparison of new purchase versus refinancing, and (3) the distribution of loans by initial relative house price level, loan-to-value ratios, and borrower credit scores. This section also examines and compares the FY 2011 book with previous books in order to gain insights into how the FY 2011 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, 2011, the characteristics for the FY 2011 book reflect only loans originated in the first three quarters--between October 1, 2010 and June 30, 2011. 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 quality indicators that could have significance for the FY 2011 Actuarial Review.

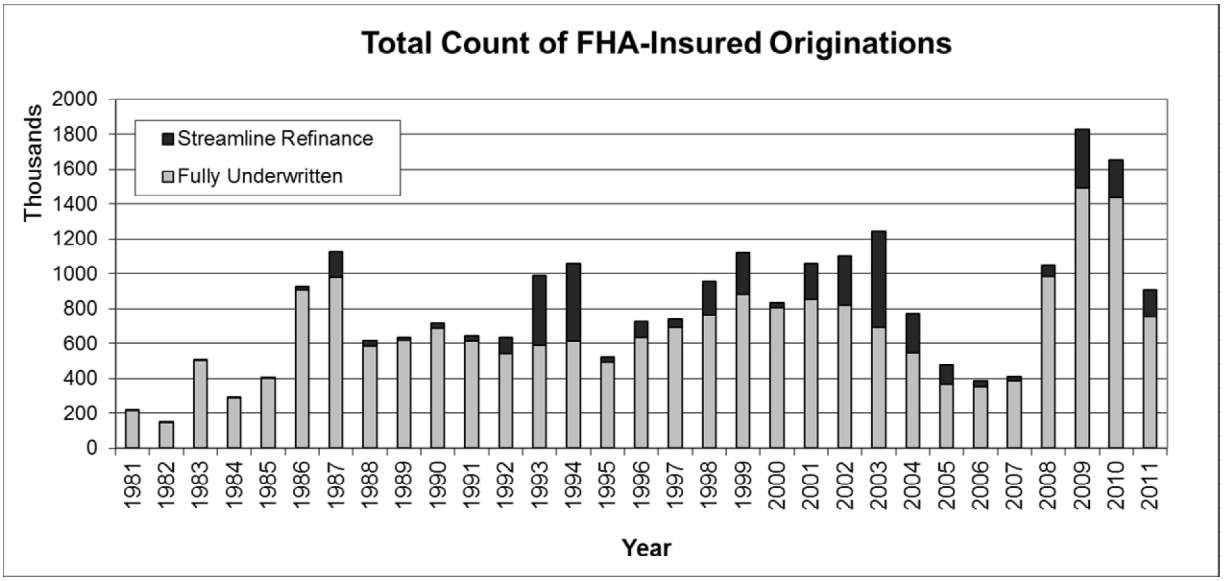
### A. Volume and Share of Mortgage Originations

We project FHA to endorse $219.40 billion in single-family mortgages in FY 2011, bringing the Fund's total unamortized IIF to $1,069.354 billion. Exhibit IV-1 shows the annual FHA origination counts as of June 30, 2011 for fully underwritten purchase and refinance loans and for streamline refinancing loans, for FY 1981 through FY 2011.

Exhibit IV-1 shows that FHA's business volume by the number of loans, which had dropped significantly from its peak in FY 2003 to FY 2006, has increased dramatically in the last four years, due to the sharp increase in its market share. 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 available capital reserves. Given the curtailment of the private mortgage insurance, the GSEs have been less able to purchase or guarantee loans with less than a 20 percent downpayment. Thus, FHA has become a primary source of higher LTV mortgage loans during the past three years. The volume of new FHA insurance has been at an historical high during the past three years.

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

**Exhibit IV-1**




Source: FHA data warehouse, June 30, 2011 extract.

Exhibit IV-2 shows FHA's origination volume and market share in home purchase mortgages from FY 1995 through FY 2011. 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 14.27 percent in FY 2010. The partial-year data in FY 2011 shows that the FHA share by loan count declined to 15.08 percent but the share by dollar volume increased to 14.66 percent from their shares in FY 2010.

**Exhibit IV-2**

| FHA's Market Share in the Home Purchase Mortgage Market | | | | | | |
|---|---|---|---|---|---|---|
| | Number of Mortgages Originated (thousands) | | | Volume of Mortgages Originated (dollars in billions) | | |
| Fiscal Year | 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[c] | 484 | 3,206 | 15.08 | 83 | 695 | 11.96 |

Sources: Existing Home Sales are from the National Association of Realtors; 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 2011 numbers are through May, 2011.

## 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 illustrates the percentage of FHA's total dollar volume originated in these ten states from FY 2007 through FY 2011. The states are ranked based on the dollar volume endorsed during FY 2011.

**Exhibit IV-3**

| Percentage of FHA Dollar Volume Originated Between FY 2007 and FY 2011 | | | | | |
|---|---|---|---|---|---|
| **State Location[a]** | **2007** | **2008** | **2009** | **2010** | **2011** |
| California | 1.83 | 7.51 | 12.80 | 15.11 | 17.47 |
| Texas | 11.02 | 7.12 | 5.51 | 6.11 | 5.66 |
| Florida | 3.40 | 3.38 | 3.54 | 4.13 | 4.52 |
| New York | 2.96 | 3.89 | 4.28 | 4.07 | 4.18 |
| Virginia | 4.73 | 4.92 | 3.87 | 4.22 | 4.13 |
| New Jersey | 4.37 | 4.35 | 4.50 | 3.94 | 3.91 |
| Pennsylvania | 3.10 | 4.27 | 4.19 | 3.63 | 3.69 |
| Maryland | 3.14 | 3.28 | 3.47 | 3.73 | 3.51 |
| Illinois | 4.14 | 4.08 | 4.08 | 3.61 | 3.32 |
| Colorado | 3.49 | 3.2 | 3.23 | 3.11 | 3.13 |

Source: FHA data warehouse, June 30, 2011 extract.
[a] States are ranked according to their share of FY 2011 origination volume in the Fund.

The percentage share of FHA loans originated in California increased ten-fold from 1.52 percent in FY 2006 to 17.47 percent in FY 2011, partially 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 price levels and growth rates in the local housing markets are captured by our econometric models through the variables measuring relative house price level and the probability of negative equity. 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 78 percent of the business over the period 1981-2011. 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 2005 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 2011 dropped to an average level of 75.16 percent. The corresponding average yearly share of 30-year SRs increased during the same three-year period to 16.86 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 5.89 percent in FY 2011. As ARMs are more vulnerable to economic downturns, the smaller concentration of ARMs in the most recent books of business will help the performance of the Fund portfolio during the next few years. The 15-year FRMs have increased from 1.22 percent in FY2007 to 5.86 percent in FY2011. However 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 |
| 1982 | 99.62 | 0.38 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1983 | 93.71 | 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 | 29.95 | 7.75 | 2.13 |
| 1994 | 42.50 | 1.81 | 16.97 | 27.95 | 8.06 | 2.72 |
| 1995 | 65.11 | 1.28 | 29.24 | 2.78 | 0.94 | 0.65 |
| 1996 | 61.09 | 1.29 | 25.42 | 8.65 | 1.72 | 1.83 |
| 1997 | 57.19 | 1.10 | 35.06 | 3.62 | 0.69 | 2.34 |
| 1998 | 65.57 | 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 | 75.83 | 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 | 1.36 | 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 | 76.79 | 2.20 | 0.73 | 19.58 | 0.38 | 0.32 |
| 2010 | 78.70 | 3.63 | 2.85 | 13.43 | 0.36 | 1.03 |
| 2011[a] | 70.00 | 5.86 | 4.07 | 17.58 | 0.67 | 1.82 |

Source: FHA data warehouse, June 30, 2011 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 1982 through FY 2011.

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 are 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 firm limit of 96.5 percent on LTV, with no additional allowance for the financing of closing costs. During FY 2009, 20.52 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 and FY 2011, this concentration further dropped to only 4.48 and 5.51 percent, respectively. Thus the relative percentage of mortgages in this highest risk category in FY 2011 was only 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 probability of negative equity variable. Holding everything else constant, loans with higher original LTVs will experience a higher probability of negative equity 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 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%** |
| 1982 | 16.40 | 19.17 | 26.72 | 22.52 | 14.34 | 0.83 |
| 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 | 11.91 | 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 | 26.19 | 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 | 4.48 |
| 2011[a] | 0.01 | 5.45 | 15.75 | 11.58 | 61.71 | 5.51 |

Source: FHA data warehouse, June 30, 2011 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 FICO score distribution showed significant improvement over the previous years. Approximately 60.78 percent of the FY 2011 loans have FICO scores above 680. Loans with FICO scores below 600 are less than 1 percent of the loans originated in FY 2011, which is a substantial decline from the FY 2008 book, where nearly 25 percent of the loans had FICO 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 FICO score and the category "Not Collected" refers to loans where no attempt was made to obtain the FICO score.

**Exhibit IV-6**

| Distribution of Originations by Credit Score Category[a] (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 | 3.92 | 0.03 | 0.71 | 1.89 | 3.81 | 4.50 | 8.23 | 76.91 |
| 1997 | 2.37 | 0.19 | 1.39 | 2.56 | 4.17 | 3.98 | 5.60 | 79.73 |
| 1998 | 1.81 | 0.24 | 1.84 | 3.19 | 5.23 | 4.70 | 5.52 | 77.47 |
| 1999 | 1.71 | 0.22 | 1.83 | 3.32 | 5.40 | 4.67 | 4.99 | 77.86 |
| 2000 | 1.89 | 0.33 | 2.44 | 3.47 | 5.00 | 4.01 | 4.01 | 78.85 |
| 2001 | 1.37 | 0.27 | 2.14 | 3.31 | 4.64 | 3.78 | 3.92 | 80.58 |
| 2002 | 1.33 | 0.31 | 2.33 | 3.58 | 5.09 | 4.22 | 4.57 | 78.58 |
| 2003 | 1.45 | 0.32 | 2.69 | 4.29 | 6.18 | 5.18 | 5.63 | 74.27 |
| 2004[c] | 3.04 | 0.51 | 4.94 | 8.65 | 12.58 | 10.43 | 11.71 | 48.14 |
| 2005[b] | 4.95 | 0.93 | 9.33 | 16.96 | 24.58 | 20.26 | 23.00 | |
| 2006[b] | 4.60 | 0.92 | 8.70 | 16.56 | 24.39 | 20.71 | 24.12 | |
| 2007[b] | 4.33 | 1.44 | 11.67 | 19.45 | 24.84 | 18.83 | 19.44 | |
| 2008[b] | 2.06 | 0.81 | 7.14 | 14.79 | 24.69 | 22.45 | 28.05 | |
| 2009[b] | 0.59 | 0.05 | 1.20 | 5.63 | 19.41 | 25.42 | 47.70 | |
| 2010[b] | 0.50 | 0.01 | 0.19 | 1.05 | 14.38 | 26.72 | 57.15 | |
| 2011[b] | 0.33 | 0.00 | 0.08 | 0.56 | 9.68 | 28.56 | 60.78 | |

[a] Most FICO 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 are required to report FICO data directly to HUD.
[c] Mixture of the above two sources of data.

## F. Initial Relative House Price Distributions

The relative house price variable is computed by comparing the original purchase price of the house underlying a particular mortgage with the median house value in the same time period and location. Census median house value data at the county and metropolitan Core Based Statistical Area (CBSA) levels for the years 1990, 2000, and annually for 2006 through 2010 were provided by HUD. Quarterly median price estimates for all time periods from 1990 through 2011 were derived through linear interpolation or extrapolation of these official estimates. The CBSA median price estimates were applied to FHA loans with properties located in metropolitan areas. Estimates of state-level median prices for non-metro areas were developed using the Census non-

metro county median price estimates. The state-level non-metro median estimates were then applied to FHA loans secured by properties not located in a CBSA.

The relative house price variable (1) enables the model to account for the impact of changes in FHA loan limits on the distribution of FHA property values; and (2) provides a broad-based approach by applying a market-wide estimate of median property values, rather than relying on FHA-specific estimates. This allows the models to account for the position of FHA loans within the broader market, which has been changing rapidly in view of recent market developments--in particular with the expansion in FHA endorsements and the contraction in conventional mortgage originations. For streamline refinance mortgages, we develop a comparable measure using the relative house price of the original fully underwritten mortgage to the same borrower, along with additional variables specific to streamlined products.

Exhibit IV-7 shows the percentage of new fully underwritten mortgage originations within each relative house price category. The distribution has been reasonably stable over time with the largest share in the 50-to-100 percent of area median house price categories, as would be expected based on FHA lending limits. Since FY 2002, there has been a trend of a steady increase in the relative proportion in the highest house price category. The proportion in the highest house price category increased from 8.68 percent in FY 2008 to 38.37 percent in FY 2011. On the other hand, the share in below-median house price category dropped from 62.18 percent in FY 2008 to 28.41 percent in FY 2011, the lowest level in the last 30 years.

FHA experience indicates that more expensive houses tend to perform better compared with smaller houses in the same geographical area, all else being equal. The average-priced houses in the marketplace, which historically have been the larger houses having FHA-insured mortgages, incur claims at a lower rate than do lower-priced houses. The average-quality housing market is relatively more liquid and there are a relatively large number of these similar-quality homes in the area. Thus, the price volatility of these houses tends to be smaller in comparison to the house-price volatility of the extremely low- and high-priced houses—the latter being a small percentage of FHA's share due to the loan size limits, but less so for the last few books of business since the raising of the limits in 2009.

**Exhibit IV-7**

| Distribution of Originations by Relative House Price Category (Percentage of Fully Underwritten FHA Insured Mortgages by Dollar Volume) | | | | | | |
|---|---|---|---|---|---|---|
| **Books of Business** | **0-50% of Median House Price** | **50-75% of Median House Price** | **75-100% of Median House Price** | **100-125% of Median House Price** | **125-150% of Median House Price** | **>150% of Median House Price** |
| 1982 | 9.50 | 22.46 | 28.00 | 22.08 | 10.49 | 7.47 |
| 1983 | 5.74 | 20.91 | 29.29 | 23.35 | 11.90 | 8.81 |
| 1984 | 8.40 | 24.14 | 29.44 | 21.30 | 10.03 | 6.68 |
| 1985 | 7.66 | 24.41 | 28.25 | 21.00 | 11.05 | 7.62 |
| 1986 | 4.89 | 20.32 | 29.27 | 24.00 | 13.14 | 8.38 |
| 1987 | 5.13 | 21.75 | 31.16 | 23.56 | 11.82 | 6.58 |
| 1988 | 7.03 | 25.99 | 33.11 | 21.31 | 8.79 | 3.77 |
| 1989 | 6.65 | 25.76 | 33.77 | 21.18 | 8.92 | 3.71 |
| 1990 | 5.89 | 24.48 | 33.86 | 22.49 | 9.57 | 3.70 |
| 1991 | 6.21 | 26.17 | 34.77 | 22.04 | 8.19 | 2.62 |
| 1992 | 6.62 | 28.01 | 36.38 | 20.87 | 6.44 | 1.68 |
| 1993 | 6.89 | 29.47 | 37.41 | 19.78 | 5.30 | 1.16 |
| 1994 | 7.66 | 31.12 | 36.74 | 18.62 | 4.85 | 1.02 |
| 1995 | 10.00 | 34.16 | 35.53 | 16.08 | 3.42 | 0.82 |
| 1996 | 9.30 | 33.01 | 36.08 | 17.01 | 3.63 | 0.98 |
| 1997 | 9.81 | 33.71 | 36.22 | 16.02 | 3.27 | 0.97 |
| 1998 | 8.91 | 33.44 | 37.41 | 16.07 | 3.24 | 0.93 |
| 1999 | 7.21 | 30.58 | 37.54 | 17.91 | 5.13 | 1.63 |
| 2000 | 7.08 | 30.13 | 37.01 | 17.90 | 5.84 | 2.04 |
| 2001 | 8.43 | 32.23 | 35.76 | 16.18 | 5.37 | 2.02 |
| 2002 | 9.66 | 33.41 | 33.57 | 15.86 | 5.48 | 2.02 |
| 2003 | 9.09 | 32.89 | 33.23 | 16.56 | 5.81 | 2.42 |
| 2004 | 8.97 | 32.27 | 33.11 | 16.86 | 5.95 | 2.84 |
| 2005 | 7.56 | 29.61 | 33.90 | 18.28 | 6.87 | 3.78 |
| 2006 | 6.42 | 26.14 | 34.04 | 19.68 | 8.20 | 5.51 |
| 2007 | 6.29 | 25.47 | 33.74 | 19.86 | 8.57 | 6.08 |
| 2008 | 6.11 | 24.07 | 32.00 | 19.76 | 9.38 | 8.68 |
| 2009 | 8.48 | 22.85 | 27.57 | 18.82 | 10.41 | 11.88 |
| 2010 | 4.85 | 15.58 | 23.03 | 20.47 | 13.65 | 22.43 |
| 2011[a] | 2.74 | 9.52 | 16.15 | 18.06 | 15.16 | 38.37 |

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 2011 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 the interest rate is projected to rise rapidly for the next two years, the prepayment rates of the FY 2009 through FY 2011 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 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[a] | 4.66 | 4.19 | 3.50 | 4.62 | 4.18 | 3.68 | 4.57 |

Source: FHA data warehouse, June 30, 2011 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. 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**

| Concentration of Loans with Downpayment Assistance by Source (Percent)[a] | | | | | |
|---|---|---|---|---|---|
| **Origination 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[b] | 84.70 | 14.12 | 0.14 | 0.97 | 0.07 |

Source: FHA data warehouse, June 30, 2011 extract.

[a] As a percentage of all Fund endorsed loans, including purchase and refinance loans. The concentration 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 of Loans with Different Downpayment Assistance Sources (Percent) | | | | | |
|---|---|---|---|---|---|
| **Origination Year** | **No Gift** | **Relative** | **Non-profit, Religious, or Community** | **Government** | **Employer** |
| 2002 | 5.07 | 6.05 | 16.00 | 13.48 | 7.61 |
| 2003 | 4.50 | 6.11 | 16.24 | 13.44 | 9.04 |
| 2004 | 5.44 | 6.63 | 16.65 | 11.31 | 9.28 |
| 2005 | 6.86 | 7.90 | 17.45 | 12.36 | 9.77 |
| 2006 | 7.86 | 8.49 | 16.54 | 10.56 | 13.16 |
| 2007 | 7.11 | 7.21 | 13.76 | 9.81 | 9.06 |
| 2008 | 3.83 | 3.03 | 6.33 | 5.04 | 3.00 |

Source: FHA data warehouse, June 30, 2011 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[22] 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 all cash flows (in contrast to present value of future cash flows as shown else Exhibits in this Report) of loans since their origination by downpayment assistance sources. While loans funded with assistance from non-profit organizations account for about 18.56 percent of the origination volume of FY 2001 through FY 2008 downpayment-assisted loans, they generate 41.06 percent of the negative present value of all cash flows from these books of business.

[22] "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 All Cash Flows Since Endorsement as of the End of FY 2011 By Downpayment Assistance Source ($ Millions)[a] | | | | | | |
|---|---|---|---|---|---|---|
| **Origination Year** | **No Gift** | **Relative** | **Non-Profit, Religious, or Community** | **Government** | **Employer** | **Total** |
| 2001 | -204 | -102 | -371 | -82 | 0 | -758 |
| 2002 | -113 | -60 | -519 | -102 | 0 | -794 |
| 2003 | -416 | -86 | -1,254 | -105 | 0 | -1,860 |
| 2004 | -1,443 | -380 | -2,238 | -93 | 0 | -4,153 |
| 2005 | -1,440 | -256 | -1,631 | -184 | 0 | -3,512 |
| 2006 | -2,103 | -319 | -1,715 | -145 | 0 | -4,282 |
| 2007 | -3,095 | -599 | -2,377 | -172 | 0 | -6,242 |
| 2008 | -7,806 | -663 | -4,019 | -307 | 0 | -12,795 |
| **Total** | -16,620 | -2,466 | -14,122 | -1,190 | 0 | -34,397 |

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

These costly non-profit downpayment 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* $14.12 billion to the economic value of the MMI Fund as of the end of FY 2011. We also estimated that these loans accounted for $46.42 billion of the amortized IIF as of the end of FY 2011. Therefore, if these loans had been excluded from the Fund, the revised economic value and the amortized IIF of the Fund would have been $15.32 billion and $962.93 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 will be much improved over what would have been the case if these loans had still been underwritten in significant amounts.

## Section V: Sensitivity of the Fund - Performance under Alternative Scenarios

This section reports the results of the sensitivity analyses performed as part of the FY 2011 Actuarial Review of the Fund.[23] The base-case economic value projections for the Fund in this year's Review are lower than the base-case projections of last year's Review. However, the economic value projections are quite sensitive to the economic forecasts on which they are based. To better understand possible deviations of the economic value of the Fund with respect to the base-case forecasts, five sensitivity analyses were conducted. While these scenarios include only a subset of all possible future outcomes, they do provide insights into the magnitude and likelihood of better or worse economic outcomes and the impacts on the Fund performance. The five scenarios are:

- Stronger Near-Term Rebound
- Mild Second Recession
- Deeper Second Recession
- Protracted Slump
- Low Interest Rates

The first four scenarios are drawn from alternative economic forecast scenarios published by Moody's Analytics in July 2011, with some modifications, and the low interest rate scenario was specified by the IFE Group. Moody's alternative forecast scenarios contain various interest rate projections, including mortgage contract rates, 1-year and 10-year Treasury rates, and alternative FHFA repeat sales house price index forecasts at the local market level. Moody's assumes that the long-term national and local HPIs for the alternative scenarios will converge to the same level as under the base-case scenario. A widely held alternative view is that it is the house price appreciation *rates* (HPA) that will converge in the long run, rather than HPI *levels*. We have modified Moody's long-term HPI forecasts to be consistent with this alternative view, yielding corresponding HPA paths associated with the first four alternative scenarios.

These alternative scenarios diverge significantly from the base case. After our modification, the stronger rebound scenario is more optimistic than Moody's original forecast, while the three stressed scenarios are more pessimistic than Moody's corresponding forecasts. The specific modification procedure and the modified HPI paths are described more fully in Appendix D, as is the fifth scenario incorporating low interest rates. This fifth scenario couples the base-case house price scenario with an interest rate path that assumes a two-year continuation of the very low rates of 2011.

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

We used the July 2011 quarterly economic forecasts from Moody's Analytics for the base-case actuarial analysis. The forecasted series include the FHFA local house price indices at MSA and state levels, the Freddie Mac 30-year fixed-rate mortgage commitment rate, and the 10-year and 1-year Constant Maturity Treasury rates.

Exhibit V-1 reproduces the projected Fund performance under the base-case scenario shown in Exhibit II-1. Under the base-case scenario, the current forecasted economic value of the Fund is $1.19 billion, and the projected economic value for FY 2018 is $59.45 billion. The economic values and IIFs of the Fund for FY 2011 through FY 2018 under the five alternative scenarios are presented in Exhibits V-2 to V-6. We discuss them in order.

**Exhibit V-1**

| Projected Fund Performance for the Base-Case Scenario ($ 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** |
| 2011 | 1,193 | 1,069,354 | 1,009,153 | 10,549 | 219,402 | |
| 2012 | 9,351 | 1,131,977 | 1,057,880 | 8,152 | 153,923 | 7 |
| 2013 | 15,637 | 1,185,849 | 1,096,849 | 6,093 | 136,430 | 193 |
| 2014 | 23,500 | 1,262,510 | 1,157,012 | 7,446 | 166,753 | 417 |
| 2015 | 32,515 | 1,376,174 | 1,252,132 | 8,345 | 206,430 | 670 |
| 2016 | 41,134 | 1,518,917 | 1,375,996 | 7,657 | 199,156 | 962 |
| 2017 | 49,865 | 1,556,638 | 1,393,483 | 7,268 | 193,575 | 1,463 |
| 2018 | 59,448 | 1,637,984 | 1,452,944 | 7,478 | 199,247 | 2,105 |

### A. Stronger Near-Term Rebound

This scenario assumes a stronger economic recovery in the later part of 2011. Under this scenario, after strong initial growth, the HPA rate reverts back to that of the base-case scenario after the first quarter of 2013. Exhibit V-2 indicates that, compared to the base-case scenario, the FY 2011 economic value of the Fund would increase by $3.22 billion from its base-case value. This positive impact relative to the base case persists through FY 2018 and would increase the FY 2018 economic value by $8.02 billion. According to Moody's, there is approximately a 10 percent probability that the future outcome will be more favorable than this scenario. Equivalently, the probability of an outcome less favorable than this scenario is about 90 percent.

**Exhibit V-2**

| Projected Fund Performance with Stronger Near-Term Rebound Scenario ($ 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** |
| 2011 | 4,416 | 1,069,355 | 1,009,153 | 10,929 | 227,606 | |
| 2012 | 14,365 | 1,162,101 | 1,087,987 | 9,925 | 191,626 | 25 |
| 2013 | 21,363 | 1,224,450 | 1,134,960 | 6,702 | 149,876 | 297 |
| 2014 | 29,844 | 1,304,830 | 1,198,349 | 7,911 | 176,588 | 570 |
| 2015 | 39,337 | 1,419,459 | 1,293,910 | 8,642 | 213,244 | 851 |
| 2016 | 48,342 | 1,562,683 | 1,417,819 | 7,841 | 203,650 | 1,164 |
| 2017 | 57,464 | 1,597,781 | 1,432,116 | 7,403 | 197,044 | 1,719 |
| 2018 | 67,465 | 1,677,311 | 1,489,289 | 7,575 | 201,832 | 2,426 |

### B. Mild Second Recession

For this scenario, Moody's assumes that "*Foreclosures continue to weigh on house prices, and the cumulative decline is deeper than in the baseline. Over the entire cycle, the NAR median house price ultimately falls by a total of 36% from the 2006 peak. The lack of recovery in the housing market limits the growth in demand for housing-related durables and motor vehicles in 2011 and early 2012.*" Moody's estimates that there is approximately a 75 percent probability that economic conditions will turn out to be better than this mild second recession scenario.

Exhibit V-3 displays the results based on this scenario. The economic value for FY 2011 decreases by $19.19 billion from the base-case projection to *negative* $18.00 billion. The economic value becomes positive at $4.71 billion by the end of FY 2015 and continues to increase to $27.17 billion by the end of FY 2018.

**Exhibit V–3**

| Projected Fund Performance under Mild Second Recession Scenario ($ 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** |
| 2011 | -17,995 | 1,069,439 | 1,009,153 | 8,094 | 203,240 | |
| 2012 | -12,780 | 1,085,731 | 1,011,673 | 5,316 | 100,902 | -101 |
| 2013 | -8,540 | 1,110,355 | 1,022,153 | 4,504 | 101,101 | -264 |
| 2014 | -2,652 | 1,166,636 | 1,063,078 | 6,116 | 138,004 | -228 |
| 2015 | 4,710 | 1,271,548 | 1,150,601 | 7,438 | 185,247 | -76 |
| 2016 | 11,938 | 1,410,804 | 1,271,799 | 7,088 | 185,387 | 139 |
| 2017 | 19,205 | 1,454,377 | 1,296,301 | 6,842 | 183,113 | 425 |
| 2018 | 27,169 | 1,540,110 | 1,361,017 | 7,154 | 191,340 | 811 |

### C. Deeper Second Recession

Under this deeper second recession scenario, Moody's assumes that "*Housing starts resume their decline, bottoming out in mid-2012, more than 80% below their peak back in 2005. No significant recovery begins until early 2013. House prices, as measured by the NAR median sales price, cumulatively fall 41% from the 2006 peak to a trough in mid-2012.*" Moody's estimates that there is a 90 percent probability that the economy will perform better than this deeper second recession scenario.

Exhibit V-4 displays the results based on this scenario. The economic value of the Fund drops well below zero under this deeper second recession scenario, and remains negative until FY 2018. The FY 2011 economic value falls by $32.73 billion from the base case to *negative* $31.54 billion. Under this scenario, the economic value would not return to a positive number until the end of FY2018, at $4.54 billion, which is $54.91 billion lower than in the base case.

**Exhibit V-4**

| Projected Fund Performance with Deeper Second Recession Scenario ($ 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** |
| 2011 | -31,538 | 1,069,516 | 1,009,153 | 5,857 | 196,526 | |
| 2012 | -27,530 | 1,069,595 | 995,486 | 4,185 | 82,591 | -177 |
| 2013 | -24,790 | 1,073,890 | 985,922 | 3,308 | 77,125 | -568 |
| 2014 | -20,522 | 1,106,784 | 1,004,210 | 4,929 | 112,295 | -662 |
| 2015 | -14,568 | 1,192,852 | 1,074,142 | 6,539 | 163,137 | -585 |
| 2016 | -8,443 | 1,323,978 | 1,188,100 | 6,557 | 171,806 | -431 |
| 2017 | -2,261 | 1,369,628 | 1,215,827 | 6,482 | 173,756 | -300 |
| 2018 | 4,542 | 1,457,783 | 1,283,813 | 6,899 | 184,590 | -95 |

## D. Protracted Slump

Under this protracted slump scenario, "*Housing starts resume their decline and ultimately fall by more than 85% cumulatively from their 2005 peak. Although they finally bottom out in the third quarter of 2012, the increase is at a snail's pace for several years. House prices, as measured by the NAR median existing sales price fall cumulatively by 46% from the 2006 peak to the third quarter of 2012.*" This scenario is the most pessimistic projection of the future housing market. Broadly speaking, Moody's estimates that there is a 96 percent probability that the economy will perform better than this protracted slump scenario.

Not surprisingly, this most pessimistic scenario produces the lowest economic value for FY 2011 among the sensitivity analyses conducted in this Review. Exhibit V-5 shows that the economic value for FY 2011 decreases to *negative* $42.75 billion. The economic value remains negative throughout the forecasting period, and the FY 2018 economic value would be *negative* $13.77 billion.

**Exhibit V-5**

| Projected Fund Performance with Protracted Slump Scenario ($ 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** |
| 2011 | -42,754 | 1,069,558 | 1,009,153 | 4,084 | 192,094 | |
| 2012 | -39,592 | 1,061,218 | 987,046 | 3,402 | 72,546 | -240 |
| 2013 | -37,814 | 1,054,313 | 966,420 | 2,595 | 63,596 | -817 |
| 2014 | -34,833 | 1,071,594 | 969,323 | 3,990 | 92,060 | -1,009 |
| 2015 | -29,975 | 1,141,726 | 1,024,232 | 5,851 | 146,340 | -993 |
| 2016 | -24,795 | 1,263,200 | 1,129,188 | 6,067 | 159,033 | -887 |
| 2017 | -19,566 | 1,306,516 | 1,155,555 | 6,111 | 164,126 | -882 |
| 2018 | -13,773 | 1,394,018 | 1,223,676 | 6,619 | 177,525 | -826 |

## E. Low Interest Rates Scenario

In Moody's base-case and in their four alternative economic scenarios, the future paths of interest rates all rise rapidly in the near term. But in the real economy, we observe that there is a non-trivial possibility that interest rates can remain low for a longer period of time. In a press release on August 9, 2011, the Federal Reserve Board announced its intention to keep the federal funds rate low for the next two years. Later, on September 21, it announced the plan to invest $400 billion in long-term Treasury securities over the next nine months in an attempt to drive down interest rates on mortgage loans, corporate bonds and other forms of credit. These most recent policies indicate that the interest rates may remain low for an extended time period. These most recent policies indicate that interest rates may remain low for an extended time period. Hence, for the fifth scenario we couple the base-case house price scenario with an interest rate path that remains at the current very low level through the end of FY 2013; the rates then gradually rise toward the long term stable levels of the base-case scenario (see Appendix D). This low interest rate scenario is constructed to better understand the sensitivity of the performance of the Fund with respect to a persistence of unusually low rates.

Exhibit V-6 indicates that under this low interest rate scenario the economic value of the FY 2011 Fund would decrease by $6.12 billion over its base-case value to *negative* $4.93 billion. This is mainly driven by an adverse selection effect. 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. On the other hand, this low interest rate scenario eliminated the sharp mortgage rate rise in FY 2013 in Moody's forecast. With lower starting interest rates, the FY 2012-2015 books would experience slower prepayment rates, bringing in more annual insurance premium. This leads to an increase of $3.17 billion in the FY 2018 economic value.

**Exhibit V-6**

| Projected Fund Performance for the Low Interest Rates Scenario ($ 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** |
| 2011 | -4,931 | 1,069,394 | 1,009,153 | 9,139 | 219,981 | |
| 2012 | 5,122 | 1,143,218 | 1,070,276 | 10,081 | 195,080 | -28 |
| 2013 | 16,991 | 1,228,830 | 1,141,964 | 11,762 | 217,619 | 106 |
| 2014 | 28,591 | 1,323,881 | 1,220,006 | 11,148 | 215,477 | 453 |
| 2015 | 37,431 | 1,413,637 | 1,289,849 | 8,025 | 183,927 | 815 |
| 2016 | 45,147 | 1,536,288 | 1,392,010 | 6,607 | 166,556 | 1,108 |
| 2017 | 53,591 | 1,574,921 | 1,408,547 | 6,839 | 179,868 | 1,606 |
| 2018 | 63,156 | 1,665,586 | 1,475,224 | 7,302 | 193,442 | 2,263 |

## F. Summary

It is clear from these scenario analyses that the Fund's financial soundness depends critically on the future course of the economy. Exhibit V-7 compares the Fund's projected economic value corresponding to each of the selected scenarios: (1) base case; (2) stronger near-term rebound; (3) mild second recession; (4) deeper second recession; (5) protracted slump; and (6) low interest rates.

Under the base-case forecast the estimated economic value of the Fund for FY 2011 is $1.19 billion. Assuming that the base-case forecast corresponds to the median scenario, the base-case scenario indicates that there is an approximately 50 percent probability that the economic value of the Fund has a low but positive value as of the end of FY 2011, based on Moody's assigned probabilities and our modeling assumptions.

The protracted slump scenario is the most severe economic scenario considered here, representing a 96th percentile stress test based on Moody's assigned probabilities. Under this scenario, the economic value of the Fund as of end of FY 2011 would be *negative* $42.75 billion. Under four of the six scenarios, the Fund would not remain financially self-sustaining for all forecasted years. Under the protracted slump scenario, the economic value would remain negative through all years projected in this Review. Thus, although under the base-case projection no additional sources of funds would be needed to cover future claim losses (excluding consideration of HECMs), if the future experience is worse than the base-case projection this may no longer be the case.

**Exhibit V-7**

| Projected Fund Economic Value by Scenario for Next 8 Years | | | | | | |
|---|---|---|---|---|---|---|
| **Fiscal Year** | **Base-Case** | **Stronger Near-Term Rebound** | **Mild 2nd Recession** | **Deeper 2nd Recession** | **Protracted Slump** | **Low Interest Rates** |
| 2011 | 1,193 | 4,416 | -17,995 | -31,538 | -42,754 | -4,931 |
| 2012 | 9,351 | 14,365 | -12,780 | -27,530 | -39,592 | 5,122 |
| 2013 | 15,637 | 21,363 | -8,540 | -24,790 | -37,814 | 16,991 |
| 2014 | 23,500 | 29,844 | -2,652 | -20,522 | -34,833 | 28,591 |
| 2015 | 32,515 | 39,337 | 4,710 | -14,568 | -29,975 | 37,431 |
| 2016 | 41,134 | 48,342 | 11,938 | -8,443 | -24,795 | 45,147 |
| 2017 | 49,865 | 57,464 | 19,205 | -2,261 | -19,566 | 53,591 |
| 2018 | 59,448 | 67,465 | 27,169 | 4,542 | -13,773 | 63,156 |

## 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 additional detail on the cash flow model and sensitivity analyses. Appendix E describes the loss severity rate model. Appendix F explains the volume forecast model.

### 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 current 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 a lender's or insurer'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, going through foreclosure means claim costs are incurred, but uncertainty about the possibility and timing of prepayment is eliminated. These competing risks present unique challenges for statistical estimation.

The models implemented for this Review extend beyond the prepay-claim competing-risk framework. In particular, the surviving mortgages, *i.e.*, not previously prepaid or claimed, are further distinguished into current and default status, where default is defined here as 90-days or more delinquent. Hence active mortgages belong to one of two statuses: current and default. As a result, each surviving mortgage can face four mutually exclusive outcomes. For a loan in default status, in the next time period it can be cured, prepaid, claimed, or remain in default status. For a loan in current status, it can go into default, be prepaid, or remain current into the next quarter. It is impossible to transit from current to claim without going through 90-day delinquent status, so current–to-claim is not included as a possible transition from being current. These events represent all possible outcomes during the subsequent quarter and hence their respective probabilities must sum to one. As a result, instead of estimating the probabilities of two termination events in the original Calhoun and Deng (2002) model, three probabilities of transition out of the original status must be estimated (the fourth is thus determined by the need

for the sum of all the probabilities to equal one). Note that if we combine the current and the default statuses together, this model reduces to the model used in FY 2009 and prior Reviews.

Following an approach suggested by Begg and Gray (1984), we estimated separate binomial logit models for transitions from current-to-default and from default-to-current (cure), for a claim termination from a default status, and to prepayment from either a current or default status. We then mathematically recombined the parameter estimates to compute the corresponding multinomial logit probabilities for the various competing risk models of default, cure, claim, and prepayment.

The multinomial logit models have several benefits over traditional linear regression. First, they ensure that the event probabilities sum to 1. This means that at any point in time, a loan can experience only one of the four possible transitions over the next period: default, become current, terminate as a claim, or terminate as a prepayment. Second, the possible values of each probability are constrained to be between zero and one under this approach. There is no possibility of estimating a negative probability or a probability exceeding 100 percent. 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 logit models are specifically designed to handle these types of observations.

We continue to apply a series of piece-wise linear spline functions to model the impact of mortgage age on conditional default, cure, claim, and prepayment probabilities. This approach is sufficiently flexible to provide a close fit during the first few years following mortgage origination, including the peak years of default, claim, or prepayment risk, while limiting the number of model parameters that have to be estimated. We have modified the approach for this year's Review to include separate sets of dummy variables for the duration of ongoing default episodes depending on whether the loan was originated in a judicial or non-judicial foreclosure state. Transitions from current status to default and prepayment termination are still modeled as age-dependent probabilities, whereas transitions from default status are modeled as age- and duration-dependent events, so that these models include age spline functions and 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 last time period of the historical data sample (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. Specifically, there are five types of status transition events that need to be predicted and hence estimated: current to default, current to prepay, default to cure, default to claim and default to prepay. The default to cure probability is further decomposed into three types of cures: loan modification, non-modification plan, and self-cure with no assistance. The probabilities of remaining at the starting status are not required to be estimated directly, because they can be directly computed from the others. That is, if no transition event occurs, then a loan will be left in its original status, with probability one minus the sum of the probabilities of the other possible transitions. Claim and prepayment are terminal transitions, in the sense that no additional quarterly observations for the loan follow either of these events. On the other hand, the transitions from current to default and from default to cure do not lead to a loan termination. The loan will remain active, but a different set of competing-risk probabilities will be applied after the transition event.

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 (defined as 90-days or more delinquent). A dynamic event history sample was constructed from the database of loan originations by creating additional observations for each quarter that the loan was active, from the origination date up to and including the termination date for the loan, or the second quarter of FY 2011 if the loan had not terminated prior to that date. 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 2011 analysis. This produced a starting population of over 25 million single-family loans originated between FY 1975 through the second quarter of FY 2011. Among these loans, historical status transition records during FY 1990 and later years were reconstructed to estimate the loan status transition models. Our model estimation dataset did not include pre-1990 data due to the limited availability of new 90-day default episode data. The resulting dataset was used to generate loan-level transition event histories until the end of the observed data period.

Estimation and forecasting were 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 |

In all, there are 7 transition probabilities to estimate for 6 loan product types, for a total of 42 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 | 5 percent |
| Product 2 | FRM15 | 20 percent |
| Product 3 | ARM | 20 percent |
| Product 4 | FRM30_SR | 50 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 2011.

**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. In this

Review, a multiple regression model was estimated to "explain" the loss severity rate. The loss severity model captured characteristics of the loan, the collateral house, the borrower, and the housing market environment when a claim occurs. The model was estimated using ordinary least squares with loan-level data from FY 1999 through FY 2009. Loss data for claims occurring in FY 2010 and later tend to be incomplete and were not yet usable for estimation purposes in this year's Review. Details of the loss severity rate model are provided in Appendix E.

**F. Volume Forecast Model**

Previous Actuarial Reviews have relied on HUD's own estimates of the future FHA mortgage volumes. In this year's review, the IFE Group independently developed an FHA mortgage volume model in order to project future FHA loan origination volumes. The modeling approach first predicts the (dollar) levels of the national purchase mortgage market volume and the national refinance market volume. The model for predicting FHA's dollar volume of streamline refinances follows a specification similar to the models used to predict the national volume. The FHA's fully underwritten refinance share of the national refinance volume represents the fourth equation of our system. The dollar volume of FHA's fully underwritten refinances results from multiplying the national refinance volume by FHA's fully underwritten refinance share of that market. Similarly, FHA's purchase origination volume is estimated as a share of the national purchase market volume. The modeling system will vary its predictions according to alternative scenarios for interest rates and home prices. For example, a forecast of higher interest rates will naturally depress refinancing volume. The volume predictions for Products 1-6 in the previous section are based on their recent shares of FHA purchase volume, FHA fully underwritten refinance volume, and FHA streamline refinance volume.

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## 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, 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 1990 and their performance under the range of economic conditions and mortgage market environments experienced during the past 20 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 Moody's Economy.com and assumptions concerning FHA's future endorsement portfolio composition 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 four 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 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. One of the critical economic variables used in making these projections is future house price appreciation rates. As illustrated in Section V, the changes in forecasted house price appreciation rates have a dramatic impact on the Fund's projected economic condition. Moody's July 2011 base-case economic forecast remains pessimistic in the short term.

If future house prices are even more pessimistic than Moody's base-case forecast, then actual claim rates will be higher than those projected in this Review. Conversely, if future house price changes are more optimistic than Moody's forecast, the actual claim rates would be lower than those projected in this Review. These two possibilities as well as others were explored quantitatively in Section V.

## B. Basic Data Inputs

The econometric analysis in this Review uses a data extract from FHA's data warehouse as of March 31, 2011. The volume and composition of the existing portfolio are further updated by an extract of FHA data as of June 30, 2011. Future economic conditions are based on July 2011 forecasts by Moody's Analytics. Future endorsement composition data are based on HUD's projections as of August 2011. 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 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 for the base-case economic scenario, the Fund has an economic value of $1.19 billion and unamortized IIF of $1,069.35 billion as of the end of FY 2011. Furthermore, we project that the economic value will steadily increase after FY 2011 at an average of $8.32 billion per year to $59.45 billion by the end of FY 2018. Meanwhile, the unamortized IIF will also increase, at an average compound rate of 6.28 percent per year to the end of FY 2018. 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 2011 economic value was $9.78 billion lower than projected in last year's Review and the FY 2017 economic value was $10.28 billion higher than projected in last year's Review.

As a result of the extremely stressful conditions during the last four years, the economic value of the Fund has declined to a relatively small positive value. Furthermore, under some of the alternative scenarios the economic value of the Fund is projected to be negative and to remain negative for several years. Given these circumstances, and in view of the inherent volatility of the variables used in our projections, it is possible that the economic value of the Fund could become and remain negative for several years. This could occur if there is a slightly adverse fluctuation in one or more of the factors that affect the performance of the Fund or if some unexpected event occurs that negatively impacts the Fund.

According to Moody's Analytics forecast in July 2011, house prices are expected to remain weak through 2012. The short-term house price growth forecast is lower than that of Moody's July 2010 forecast, but the longer-term forecast is more favorable than the one used last year. On net, the economic value of the Fund in future years has increased significantly due to the new, higher forecast of house price growth.

The credit quality of recent endorsements under the Fund has shown significant improvement over the average credit quality of historical books. Due to capital constraints, most private mortgage insurance companies in the U.S. have tightened their underwriting standards considerably. This leaves the FHA as the primary source of housing finance for borrowers with higher LTV ratios. HUD forecasts that the credit quality of future books will gradually return to their compositions in the mid-1990s, before the emergence of the subprime markets. The

improved credit-risk profile compared to what was projected last year and that of the recent and future books have significantly improved 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 announced[24] that for loans for which a case number is assigned on or after October 4, 2010, the upfront premium will be reduced to 1.00 percent for all mortgage types, but the annual premium for loans with 30-year terms will be increased substantially. For loans originated after March 2011, the annual premium was further increased by another 25 basis points. The increased annual premiums and their slow projected prepayment rates make the FY 2011 and projected FY 2012 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, the status transition model has been enhanced to capture the different behavior between loans having no prior 90-day delinquent record and those that had a prior delinquent-cure record. Second, the large amount of stressed-loan observations in the past two years enabled us to estimate more precisely the transition probabilities of loans with high probability of negative equity. Third, the linkage of streamline refinance loans with their original fully underwritten loans is carried to a higher level of precision. The enhanced model is more sensitive and should better capture the behavior of loans, especially during a stressed economy. For this year's Review, instead of relying on HUD's own estimates of future mortgage endorsement volume, the IFE Group developed an econometric model of national and FHA mortgage volumes. This model will vary its predictions with variations in economic scenarios.

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 was almost zero in FY 2010 and FY 2011. 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 $15.32 billion in FY 2011, a $14.12 billion improvement over the economic value of $1.19 estimated in the report.

[24] Mortgagee Letter 2010-28, September 2010, Changes to FHA Mortgage Insurance Premiums.

# 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 2011 Review. The models follow those implemented in FY 2010, with a number of enhancements.

For the FY 2011 Review, we extended the default-status model in two directions. First, we now account for whether a loan has experienced any prior default episodes. Econometrically, this entailed including an indicator of whether a loan had ever been in a 90-day default episode (not including the present episode for a loan in 90-day default status). Second, we distinguished among three different types of default-to-current status transitions, depending on whether a loan returns to current status by self-curing, through use of a loan modification or other form of partial claim, or by benefiting from some other form of loss mitigation activity such as a repayment plan or lender forbearance. Modeling separate cure types in this manner enables us to project the mix of future loss mitigation activities as a function of the same economic factors used to model future default, claim, and prepayment events. These and other changes to the models are discussed in greater detail 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 logit probability framework that is "built up" by estimating separate binomial logit models for each type of mortgage status transition. We specify the mathematical derivation of the multinomial logit 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 logit model coefficients are presented in Section III.

## I. Model Specification and Estimation Issues

### A. Specification of FHA Mortgage Status Transition and Termination Models

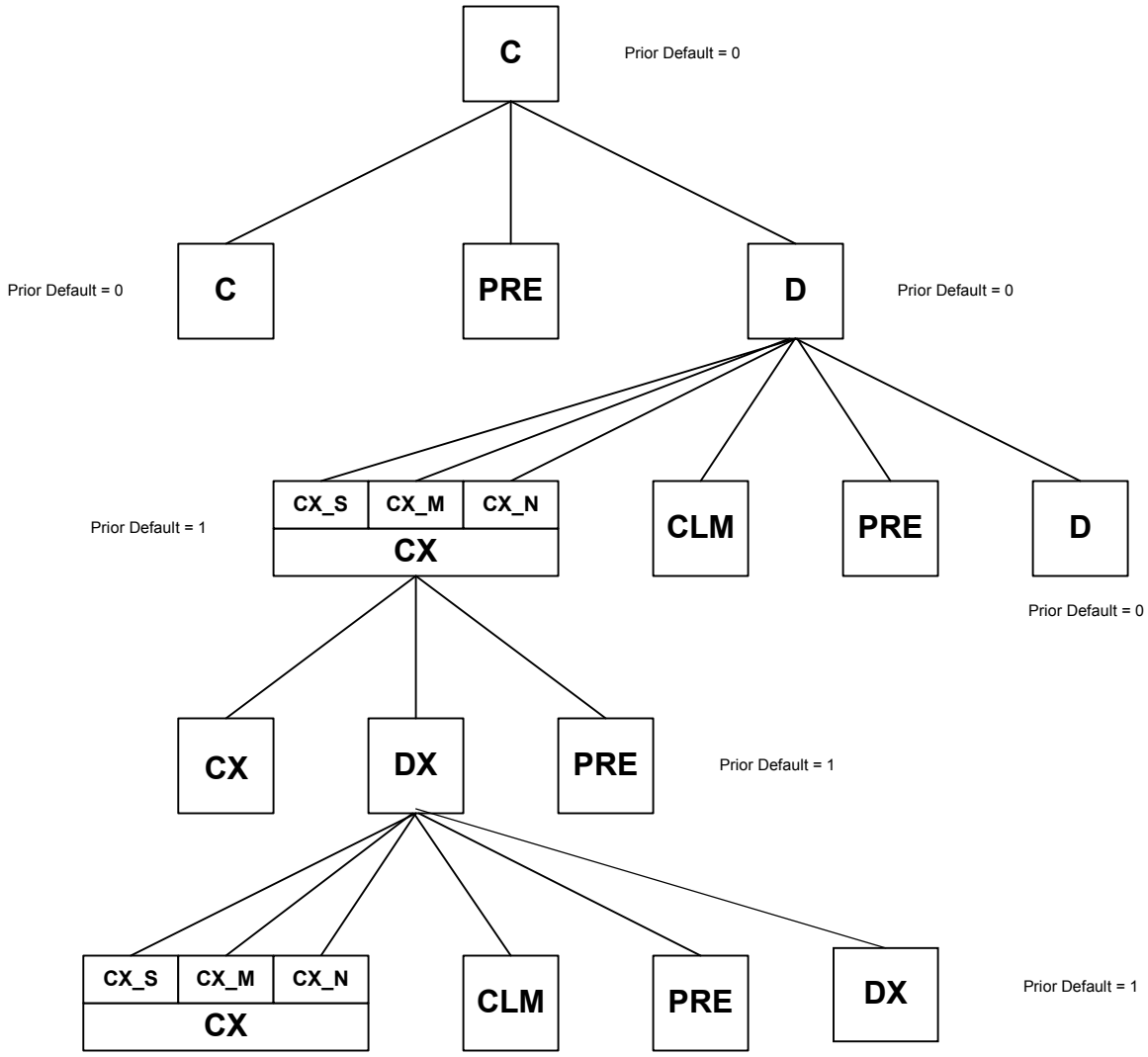
Prior to the FY 2010 Review, we applied a competing risk framework based on multinomial logit models for quarterly conditional probabilities of prepayment and claim terminations. The general approach was based on the multinomial logit models reported by Calhoun and Deng (2002) that were originally developed for application to FHFA's risk-based capital adequacy test for Fannie Mae and Freddie Mac. The multinomial model recognizes the competing-risks nature of prepayment, default and claim terminations.

Combining multiple data sources, FHA has developed historical data on new 90-day default episodes that have occurred on outstanding mortgages beginning FY 1990 Q1. The date at which a loan is first reported to be 90-or-more days in arrears is used to identify the start of a default episode, which 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. Thus, a new default event (entry into 90-day default status) is defined to occur during the quarter preceding the quarter the loan is first assigned to default status, i.e., it begins the quarter in default status.

We used the data on 90-day or greater delinquencies to develop and apply an expanded version of the status transition approach that extends the analysis to a transition framework that models seven transitions from current-to-default, current-to-prepay, default-to-prepay, default-to-claim, and three types of default-to-current transitions now described. Exhibit A-1 highlights the new status transitions that we have modeled for the FY 2011 Review. Note that we now track loans with and without prior default episodes as separate loan status categories, thereby introducing a form of path dependence into the analysis. Loans originating in current status (C) either transition to default status (D) at the start of the next quarter, terminate as a prepayment (PRE), or continue in current status. Loans that have undergone transitions to default status and returned to current status have by definition had a prior default episode and are assigned to a separate current status CX. Loans transition from default status D to status CX along three possible paths, depending on whether they self-cure (CX_S), cure with a loan modification (CX_M), or cure using another form of non-mod loss mitigation (CX_N). Loans returning to current status along any of these three paths are combined into the single current status CX for modeling subsequent transitions to default or prepayment. While this approach models the mix of cure types, it stops short of expanding the state space to include separate loan statuses for the three 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.

This year we no longer model current-to-claim transitions as a distinct transition type. These transitions were included last year due to the existence of a small number of loan records for which the start of a 90-day episode and the claim termination date fell within the same quarter. Improved reconciliation of loan termination dates with the ending dates of default episodes, and refinements by FHA to the development of the data on 90-day default episodes have converted virtually all of these to the more typical default-to-claim transitions and eliminated the need to estimate and project current-to-claim transitions.

## Exhibit A-1.Loan Status Transitions Framework



In summary, from a current status, there are three possible transitions: C_C, C_PRE and C_D. Since the probabilities for each of these transitions must sum to unity, only two of these transition probabilities need to be estimated and the third inferred. We chose to estimate the latter two and infer from them the C_C transition probability. Also, we do not introduce separate transitions if the loan starts in a CX status, as that would require two 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 of prior default episodes.

Similarly, from a default status, the possible transitions are six: D_D, D_CLM, D_PRE, D_CX_S, D_CX_M and D_CX_N. 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 five. And similarly to above, we used right-hand variables to indicate prior default statuses.

In all, then, there are three transitions from current status and six from default, for a total of nine. Two of the probabilities are inferred from the others, so there are seven transition probabilities to estimate. Below we show that we also estimate separate equations for 6 mortgage product types, so there is a total of 6 product types times 7 status transitions, or 42 equations to estimate.

For clarity, Exhibit A-2 demonstrates four different possible transition types as they are defined in the quarterly loan event history data. The typical situation where a loan starts a new 90-day default episode and thus experiences a new default event (NDE) and subsequently attains default status at the start of the next quarter is illustrated in Example 1. Loans that attain default status in this manner are those used to model the probability of default-to-claim, default-to-prepay, and default-to-cure events. Example 1 also illustrates the situation where such a loan ultimately results in a claim termination.

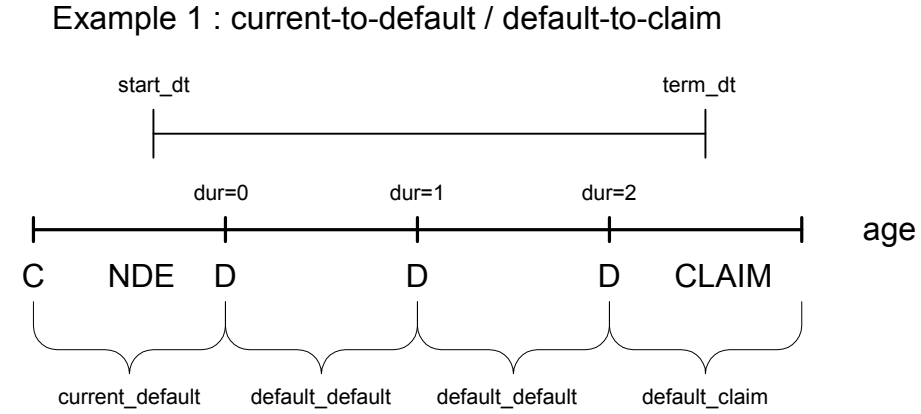
All four examples also show the measurement of the duration of a default episode. In Example 1, e.g., in the quarter a default episode starts (the first quarter here) the default duration "dur" is 0 at the start of the next quarter, and the duration increments by 1 for each quarter it remains in that particular default episode, Note from Example 2 that if the loan cures within a quarter, the loan in that quarter is defined to have a cure status at the end of the quarter, which is the beginning of the subsequent quarter.

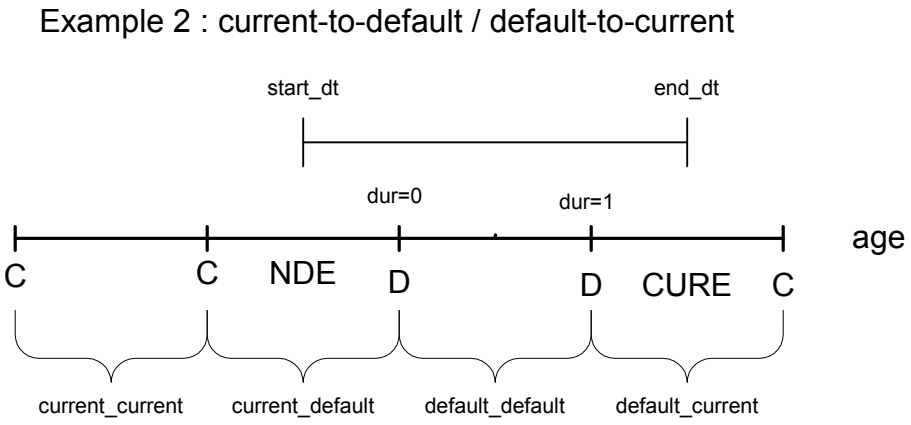
Example 2 shows the situation where a loan attains default status and subsequently cures. Example 3 illustrates a loan transitioning to default and then ultimately terminating in a prepayment. Example 4 illustrates a loan transitioning to default and remaining there through the end of the historical sample period at which point any future transitions are censored.

A newly originated loan is always classified as current in its first quarter of existence, and no new 90-day default events can occur until after the start of the second quarter. Even if a borrower never makes a payment, no arrearage is recorded until more than 30 days after

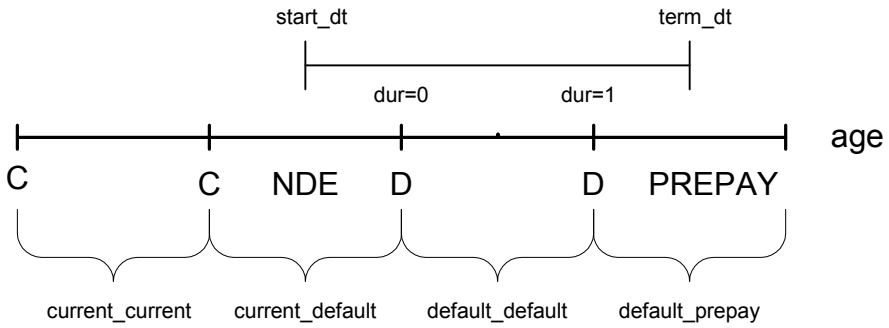
origination (i.e., they are not classified as delinquent until the first payment is missed), and similarly for 60-day and 90-day arrearages. Thus, no new 90-day default event (i.e., the start of a 90-day default episode) can occur until the second quarter.

**Exhibit A-2.Examples of Loan Transition Types**

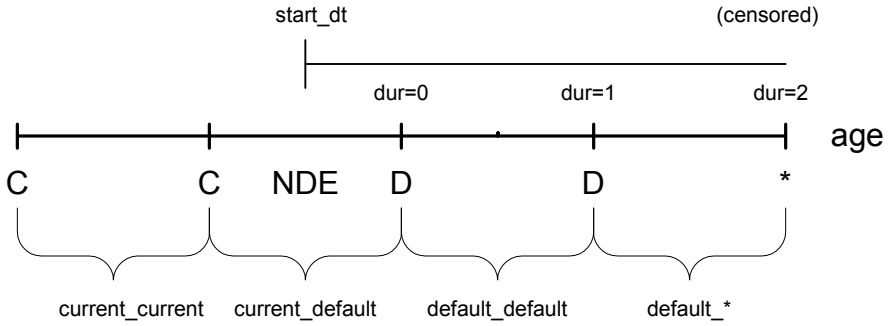


Example 3: current-to-default / default-to-prepay




Example 4: current-to-default / censored




## B. Specification of Multinomial Logit Models

As summarized above, the status transition framework results in two sets of competing risks: one for loans in current status and one 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 the quarter, the competing risks are claim, prepayment, transition to current status (cure), or remaining in default status, as shown in the second layer of transitions in Exhibit A-1. We have further expanded the number of competing risks to include three possible cure types, as shown in the third layer of transitions of Exhibit A-1. This gives rise to seven possible transition probabilities requiring estimation.

We specified multinomial logit 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 current status in a quarter $t$ to prepayment, default, and remain current, respectively, in the subsequent quarter $t + 1$ are given by:

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

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

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

The corresponding probabilities for loans starting in a default status transitioning to claim, prepayment, current (self-cured), current (via modification), current (non-mod foreclosure alternative) and continuing in default status are given by, respectively:

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

$$\pi_{PRE}^{DEF}(t) = \frac{e^{\alpha_{PRE}^{DEF} + X_{PRE}^{DEF}(t)\beta_{PRE}^{DEF}}}{11 + e^{\alpha_{CLM}^{DEF} + X_{CLM}^{DEF}(t)\beta_{CLM}^{DEF}} + e^{\alpha_{PRE}^{DEF} + X_{PRE}^{DEF}(t)\beta_{PRE}^{DEF}} + e^{\alpha_{CUR\_S}^{DEF} + X_{CUR\_S}^{DEF}(t)\beta_{CUR\_S}^{DEF}} + e^{\alpha_{CUR\_M}^{DEF} + X_{CUR\_M}^{DEF}(t)\beta_{CUR\_M}^{DEF}} + e^{\alpha_{CUR\_N}^{DEF} + X_{CUR\_N}^{DEF}(t)\beta_{CUR\_N}^{DEF}}} \quad (2b)$$

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

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

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

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

The constant terms $\alpha_f^i$ and coefficient vectors $\beta_f^i$ are the unknown parameters to be estimated for the multinomial logit model for starting status *i* indicating current (CUR) or default (DEF); and ending status $f$ indicating claim (CLM), prepayment (PRE), three types of current/cure (CUR) if coming from a default status, 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 2011 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) - (1c) and (3a) - (3b) 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.

For the FY 2011 Review we have expanded the possible ending statuses for cures to include three possible cure types – self cure (CUR_S), modification cure (CUR_M), and other non-modification loss mitigation cure (CUR_N). 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 excessively 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 logit models for each possible transition type and then recombine the estimates to derive the multinomial logit probabilities. Begg and Gray (1984) applied Bayes Law for conditional probabilities to demonstrate that the values of parameters $\alpha_f^i$ and $\beta_f^i$ estimated from separate binomial logit (BNL) models are parametrically equivalent to those for the corresponding multinomial logit (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:

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

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

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

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

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

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

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

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

Estimation of the binomial logit (BNL) probabilities in (3a) - (3b) and (4a) - (4e) produces estimates of parameters $\alpha_f^i$ and $\beta_f^i$ that can be substituted directly into equations (1a) - (1c) and (2a) - (2f) to derive the corresponding multinomial logit (MNL) probabilities There are two sets of $\alpha$s and $\beta$s, 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 was which.

## 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 March 31, 2011. The dataset was filtered for loans with missing or invalid values of key variables in our econometric model.

**E. Data Samples**

A full 100-percent sample of loan-level data from the FHA single-family data warehouse was extracted for the FY 2011 analysis. This produced a very large sample of approximately 25.85 million single-family loans originated between the first quarter of FY 1975 and the second quarter of FY 2011. We used data for the 19.49 million loans originated during and after FY 1990 to estimate the status transition models, 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.

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 |

Thus, in all, there are 7 transition probabilities to estimate for 6 loan product types, for 42 total equations to estimate.

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

| | | |
|---|---|---|
| Product 1 | FRM30 | 5 percent |
| Product 2 | FRM15 | 100 percent |
| Product 3 | ARM | 20 percent |
| Product 4 | FRM30_SR | 50 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, 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 three separate cure-types equations, as summarized in equations (2c), (2d), and (2e). 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. To avoid other coefficients be interfered by this unusual market period, we have retained the policy-period variable that accounts for the rapid expansion of the subprime market during 2004 to 2006.

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 logit models. While we continue to employ categorical (dummy) variables for the dynamic explanatory factors included in the econometric models, for this year's model we used continuous versions of static explanatory variables that represent fixed origination characteristics of the loan and the borrower, in particular, LTV, relative house price and credit score. For each of these variables, we also included their square as an additional variable, to

account for the potential non-linear relationship. In prior years, these were categorical variables. This results in a slightly more parsimonious model.

Although we spent considerable effort investigating the application of continuous versions of the dynamic explanatory factors, we were not satisfied with either the stability or interpretation of the models. The categorical variable approach continues to provide both flexibility in function form and transparency. All dynamic variables except for the mortgage age functions listed in Exhibit A-3 are applied as 0-1 dummy variables in the statistical models. For each set of categorical variables, one of the dummy variables is omitted during estimation and serves as the baseline category. The mortgage product types are the six specified above. Additional details on each set of variables are provided below.

*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-default transitions of FRM30 loans with knots (the k's) at ages 2, 4, 8, 12, and 36 quarters by generating 6 new age variables age1 to age6 defined as follows:

$$\text{age1} = \begin{cases} \text{AGE} & \text{if AGE} \le \text{k}_1 \\ \text{k}_1 & \text{if AGE} > \text{k}_1 \end{cases}$$

$$\text{age2} = \begin{cases} 0 & \text{if AGE} \le \text{k}_1 \\ \text{AGE - k}_1 & \text{if k}_1 < \text{AGE} \le \text{k}_2 \\ \text{k}_2 - \text{k}_1 & \text{if AGE} > \text{k}_2 \end{cases}$$

$$\text{age3} = \begin{cases} 0 & \text{if AGE} \le \text{k}_2 \\ \text{AGE - k}_2 & \text{if k}_2 < \text{AGE} \le \text{k}_3 \\ \text{k}_3 - \text{k}_2 & \text{if AGE} > \text{k}_3 \end{cases}$$

$$\text{age4} = \begin{cases} 0 & \text{if AGE} \le \text{k}_3 \\ \text{AGE - k}_3 & \text{if k}_3 < \text{AGE} \le \text{k}_4 \\ \text{k}_4 - \text{k}_3 & \text{if AGE} > \text{k}_4 \end{cases}$$

$$\text{age5} = \begin{cases} 0 & \text{if AGE} \le \text{k}_4 \\ \text{AGE - k}_4 & \text{if k}_4 < \text{AGE} \le \text{k}_5 \\ \text{k}_5 - \text{k}_4 & \text{if AGE} > \text{k}_5 \end{cases} \qquad (5)$$

$$\text{age6} = \begin{cases} 0 & \text{if AGE} \le \text{k}_5 \\ \text{AGE - k}_5 & \text{if AGE} > \text{k}_5 \end{cases}$$

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 6-age segment example described above is given by:

$$\text{Age Function} = \beta_1 \cdot \text{age1} + \beta_2 \cdot \text{age2} + \beta_3 \cdot \text{age3} + \beta_4 \cdot \text{age4} + \beta_5 \cdot \text{age5} + \beta_6 \cdot \text{age6} \qquad (6)$$

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*

A new approach was adopted for specifying default duration functions for the FY 2011 Review. Our research indicated that the default duration function behaves differently, both in terms of 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 for 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 0, 1, 2, 3, 4, and 5 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 5 (or more) quarters. This approach was adopted to constrain 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 5 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 5 and higher, and the level the function has attained by duration 5 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 FY 2010 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.

*Relative House Price*

The relative house price variable was computed by comparing the original purchase price of the house underlying a particular mortgage with the median house value in the same time period and location. We used decennial Census median house price data at the county and metropolitan Core Based Statistical Area (CBSA) levels for year 1990-2000, and annual median house price data for year 2006-2010. Estimates prior to 1990 are not very influential given that the estimation dataset starts in 1990. Quarterly median price estimates for 1990 to 2009 were derived through linear interpolation. Quarterly median values to 2011 were derived by extrapolating from the end of the series in 2009. The CBSA median price estimates were applied to FHA loans with properties located in those metropolitan areas. We derived separate state-wide non-metro median house price estimates using the Census county-level median data for all non-metro counties within a state. The non-metro state values were computed by taking the median of the non-metro county median values. For hypothetical loans originated after FY 2010 Q2, we applied annual growth rate assumptions consistent with the macroeconomic forecasts used when projecting the future performance of the MMI Fund.

*Loan-to-Value Ratio*

Initial loan-to-value 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 2010 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. Often, the previous mortgage was also a streamline refinance mortgage, so 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 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 value of X. That is, in this case the season (2, 3, or 4) and zero otherwise; 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:

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

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 origination of the loan, 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:

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

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).

The resulting values of PNEQ were stratified into nine levels ranging from less than 5-percent to more than 50-percent probability of negative equity as listed in Exhibit A-3.

*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)* 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).

The relative mortgage premium values for ARMs and FRMs are derived in exactly the same manner, except that the current coupon is always equal to the coupon at origination for FRMs, whereas ARM coupon rates are updated over the life of the mortgage as described next.

*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:

$$\begin{aligned} C(t) = max\{ & min[\, Index(t-S) + Margin, \\ & C(t-1) + A(t) \cdot Period\_UpCap,\, C(0) + Life\_UpCap\,], \\ & C(t-1) - A(t) \cdot Period\_DownCap(t),\, max(C(0) - Life\_DownCap, Life\_Min)\} \end{aligned} \tag{10}$$

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 (10).

*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 ratio of the ten-year Constant Maturity Treasury (CMT) yield to 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 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 at prepayment even when financially advantageous. The burnout factor is quantified as the moving average number of basis points the borrower was "in the money," with the current mortgage rate less than the contract rate, for all quarters during which the borrower was in the money during the preceding 8 quarters. The resulting measure was categorized into 50 basis point categories corresponding to 0 (always out of the money) up to a category corresponding to a moving average value exceeding 200 basis points, for a total of 6 categories.

*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. 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 receiving such 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.

Through the process of linking streamline refinance loans with the original fully underwritten FHA mortgages to the same borrowers, we have developed a parallel indicator of downpayment assistance received on the prior fully underwritten mortgages to apply when estimating the transition models for streamline refinance loans. For example, a streamline refinance loan originated in FY 2011 may be issued to a borrower that was a prior recipient of downpayment assistance, and the type of prior downpayment assistance is controlled for in the loan status transition estimates for these loans. For this reason, some of the negative impact of the earlier loans may carry over and impact the economic value of outstanding streamline refinance loans, as accounted for in our estimation process.

*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. 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 FY 2011 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 FY 2004 to FY 2011, and since estimation is now based on data for loans endorsed during FY 1990 to FY 2011, 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.

*Origination Year Indicators*

As in prior year Reviews, we included a series of origination year indicators to account for major changes in FHA underwriting requirements and the periods during which loan-level credit score data were or were not available.

*FY 1990-1995 Originations*

This period corresponds to the period of strict FHA underwriting, but includes the first years that credit score data were available through the Unicon sample data. This period corresponds to the statistical baseline period among all of the cohort year indicators and accordingly is treated as the baseline category in the model estimates reported in Exhibit A-3.

*FY 1996-2004 Originations*

An indicator for loans originated after FY 1996 Q1 is included to account for a loosening of FHA underwriting requirements, which continued through FY 2004.

*Post FY 2005 Originations*

FHA adopted a number of changes in FY 2005 with potential impacts on underwriting, including implementation of its TOTAL scorecard.

*Subprime Market Activity Period*

An indicator for policy years 2004 through 2006 is included to account for the period of rapid growth in subprime market activity. This indicator was included to control for any positive or adverse effects on FHA loan quality not already measured by the variables already included, such as FICO scores.

*Variables for Streamline Refinance Mortgages*

A major enhancement to the FY 2010 Review was the linking of streamlined refinance mortgages to the 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.

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 that appraisal to compute the LTV and PNEQ for the streamline mortgage.

We were also able to assign indicators of original LTV, relative house price, 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. Logit Model Estimation Results

Exhibit A-3 (parts A-3.1 to A-3.6) present the coefficient estimates for the binomial logit 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_ default** | **current_ prepay** | **default_ claim** | **default_ prepay** | **default_ cure_s** | **default_ cure_m** | **default_ cure_n** |
| Prior default episode | prior_default | X = 0/1 | 1.8391 | -0.7740 | -0.2369 | -0.0253 | 0.0648 | 0.3274 | 0.1513 |
| LTV | ltv | Continuous from 50 to 110. | 0.0008 | -0.0247 | 0.1169 | -0.0157 | -0.0019 | 0.0346 | 0.0225 |
| | ltv_sq | | 0.0001 | 0.0002 | -0.0006 | 0.0001 | 0.0000 | -0.0002 | -0.0001 |
| Relative house price | rel_hp | Continuous from 0. | -0.0017 | 0.0111 | -0.0028 | -0.0012 | -0.0014 | 0.0100 | 0.0030 |
| | rel_hp_sq | | 0.000002 | -0.000030 | 0.000010 | 0.000000 | 0.000004 | -0.000030 | -0.000010 |
| Credit score. | credit_score | Continuous from 300 to 850. | 0.0262 | 0.0057 | -0.0087 | -0.0092 | 0.0037 | 0.0111 | 0.0115 |
| | credit_score_sq | | -0.000020 | 0.000000 | 0.000009 | 0.000008 | 0.000000 | -0.000010 | -0.000010 |
| Missing credit score. | credit_score_999 | X = 0/1 | 5.2439 | 2.9657 | -2.0566 | -1.7398 | 1.1850 | 2.0384 | 3.0412 |
| No credit score returned. | credit_score_000 | X = 0/1 | 5.5692 | 2.4492 | -1.7651 | -2.2360 | 0.9027 | 2.5282 | 2.9301 |
| Refinance loan. | refinance | X = 0/1 | 0.2008 | 0.1716 | 0.0033 | -0.1532 | -0.1542 | 0.1417 | -0.0410 |
| Unicon loan. | unicon_loan | X = 0/1 | 0.2646 | 0.2080 | 0.3766 | 0.3302 | -0.0141 | -0.6493 | -0.2091 |
| FHA underwriting changes. | fy_1996_2004 | X = 0/1 | 0.3356 | -0.0731 | -0.0505 | -0.1978 | -0.3045 | 1.6373 | 0.3498 |
| | fy_2005_XXXX | X = 0/1 | 0.3696 | -0.2990 | -0.4998 | -0.2632 | -0.4204 | 1.8898 | 0.1907 |
| Subprime expansion. | sp_2004_2006 | X = 0/1 | -0.1817 | 0.1931 | 0.3253 | 1.0948 | 0.2347 | 0.6980 | 0.8234 |
| Downpayment assistance type. | dpa_relative | X = 0/1 | 0.1901 | 0.0054 | -0.0140 | 0.1667 | 0.0105 | 0.0972 | 0.0641 |
| | dpa_nonprof | X = 0/1 | 0.5104 | -0.1437 | 0.3734 | -0.4485 | -0.2540 | 0.4491 | -0.0714 |
| | dpa_govt | X = 0/1 | 0.3110 | -0.3750 | 0.2962 | -0.4243 | -0.0633 | 0.2000 | 0.0529 |
| Probability of negative equity. Based on FHFA house price drift and volatility estimates. | pneq05 | X<=0.05 | | | | | | | |
| | pneq10 | 0.05 < X ≤ 0.10 | 0.1295 | -0.4426 | 0.3708 | -1.2588 | -0.1600 | 0.0921 | -0.2291 |
| | pneq15 | 0.10 < X ≤ 0.15 | 0.1379 | -0.6144 | 0.4980 | -1.6331 | -0.1841 | 0.0036 | -0.3416 |
| | pneq20 | 0.15 < X ≤ 0.20 | 0.1578 | -0.7768 | 0.5851 | -1.9213 | -0.2303 | 0.0435 | -0.5200 |
| | pneq25 | 0.20 < X ≤ 0.25 | 0.1566 | -0.9187 | 0.5943 | -2.0164 | -0.2698 | -0.0321 | -0.5823 |
| | pneq30 | 0.25 < X ≤ 0.30 | 0.1918 | -1.0754 | 0.5974 | -2.0663 | -0.3455 | -0.0184 | -0.7528 |
| | pneq40 | 0.30 < X ≤ 0.40 | 0.2561 | -1.0589 | 0.6163 | -2.4208 | -0.4052 | -0.0427 | -0.8874 |
| | pneq50 | 0.40 < X ≤ 0.50 | 0.3158 | -1.0094 | 0.6265 | -2.2774 | -0.4959 | -0.1468 | -0.9328 |
| | pneq100 | 0.50 < X ≤ 1.00 | 0.6172 | -0.9890 | 0.5961 | -2.5153 | -0.8060 | -0.1590 | -1.2663 |
| Mortgage premium. Difference between current coupon rate and average FRM market rate, divided by current coupon rate. | relspread_00 | X ≤ 0 | | | | | | | |
| | relspread_10 | 0 <X ≤ 10 | 0.1522 | 0.4040 | 0.0596 | -0.0072 | -0.0447 | -0.0738 | -0.0323 |
| | relspread_20 | 10 < X ≤ 20 | 0.2794 | 1.1065 | 0.0209 | 0.0581 | -0.1020 | -0.2063 | -0.2571 |
| | relspread_30 | 20 < X ≤ 30 | 0.3487 | 1.5149 | -0.0067 | 0.0441 | -0.1598 | -0.1558 | -0.4204 |
| | relspread_40 | 30 < X | -0.0245 | 1.3946 | -0.0902 | -0.0367 | -0.3152 | -0.0579 | -0.6686 |
| Burnout factor. Moving average number of basis points prepayment option in the money over preceding 8 quarters. | in_money_00 | X ≤ 0 | | | | | | | |
| | in_money_50 | 0 < X ≤ 50 | 0.1275 | 0.1748 | 0.0226 | 0.0643 | 0.0266 | 0.1556 | 0.0545 |
| | in_money_100 | 50 < X ≤ 100 | 0.2153 | 0.1930 | 0.0514 | 0.1348 | 0.0265 | 0.2978 | 0.0914 |
| | in_money_150 | 100 < X ≤ 150 | 0.3548 | 0.1287 | 0.0385 | 0.1589 | -0.0006 | 0.2456 | 0.1139 |
| | in_money_200 | 150 < X ≤ 200 | 0.4807 | -0.0096 | 0.0829 | 0.1782 | 0.0129 | 0.1652 | 0.1492 |
| | in_money_250 | X > 200 | 0.6785 | -0.0615 | 0.1877 | 0.2184 | 0.0522 | 0.2622 | 0.1054 |
| Yield curve slope measured as ratio of 10_year CMT to 1-year CMT rates. | ycslope_1 | X ≤ 1 | | | | | | | |
| | ycslope_1p2 | 1.0 < X ≤ 1.2 | 0.1022 | -0.2007 | -0.3689 | -0.1418 | -0.0296 | -0.3597 | -0.4768 |
| | ycslope_1p5 | 1.2 < X ≤ 1.5 | 0.0956 | -0.2028 | -0.5155 | -0.2443 | -0.2146 | -0.2968 | -0.0418 |
| | ycslope_2 | 1.5 < X ≤ 2.0 | 0.2039 | -0.0047 | -0.2180 | -0.3568 | 0.0198 | -0.3242 | -0.5974 |
| | ycslope_3 | X > 2.0 | 0.2266 | 0.1687 | -0.5866 | -0.2549 | -0.2007 | -0.3507 | -0.3840 |
| Season of year. | season_winter | X = 1 | | | | | | | |
| | season_spring | X = 2 | -0.0758 | 0.0364 | 0.0560 | 0.0735 | -0.1162 | 0.4873 | -0.0280 |
| | season_summer | X = 3 | 0.0868 | 0.0321 | 0.0156 | 0.0028 | -0.2769 | 0.3808 | 0.0206 |
| | season_fall | X = 4 | 0.1236 | -0.1456 | -0.0379 | -0.2475 | 0.0278 | -1.2187 | -1.7005 |
| Judicial foreclosure state. | judicial | X = 0/1 | 0.0153 | -0.1983 | | | | | |
| Default duration function for judicial foreclosure state. | judicial_01 | 0 ≤ X ≤ 1 | | | -0.7925 | -0.3047 | -0.1570 | -0.1999 | -0.1241 |
| | dur_dum_2_judicial | X = 2 | | | -0.4162 | -0.4820 | -0.8829 | 0.2231 | -0.1760 |
| | dur_dum_3_judicial | X = 3 | | | -0.2251 | -0.6594 | -1.1181 | 0.1448 | -0.3419 |
| | dur_dum_4_judicial | X = 4 | | | -0.2091 | -0.5248 | -0.9492 | -0.0911 | -0.5370 |
| | dur_dum_5_judicial | X ≥ 5 | | | -0.3861 | -0.5278 | -1.5278 | -0.6465 | -0.8389 |
| Default duration function for non-judicial foreclosure state. | dur_dum_2_non_jud | X = 2 | | | -0.0787 | -0.3112 | -0.7265 | 0.3862 | 0.0324 |
| | dur_dum_3_non_jud | X = 3 | | | -0.1394 | -0.4021 | -0.9595 | 0.2843 | 0.0196 |
| | dur_dum_4_non_jud | X = 4 | | | -0.2217 | -0.4697 | -0.8460 | 0.0497 | -0.1467 |
| | dur_dum_5_non_jud | X ≥ 5 | | | -0.4425 | -0.4859 | -1.3009 | -0.5021 | -0.5904 |
| Mortgage age function. Piece-wise linear spline for ages up to specified knot points (shown as the number of quarters since origination). | age1 | Age spline function knot values given in respective columns to the right next to the corresponding coefficient estimates. | 2 1.2057 | 2 0.6365 | 4 0.0054 | 4 0.0020 | 4 -0.0471 | 4 0.9250 | 4 0.4059 |
| | age2 | | 4 0.1794 | 4 0.0848 | 8 0.0659 | 8 0.0129 | 8 0.0370 | 8 0.1216 | 8 -0.0035 |
| | age3 | | 8 0.0103 | 8 0.0033 | 12 0.0394 | 12 0.0085 | 12 0.0100 | 12 -0.0175 | 12 0.0274 |
| | age4 | | 12 -0.0256 | 12 -0.0101 | 16 0.0074 | 16 -0.0055 | 16 0.0043 | 16 0.0371 | 16 0.0142 |
| | age5 | | 36 -0.0240 | 16 -0.0555 | 20 -0.0204 | 20 -0.0290 | 20 -0.0008 | 20 0.0305 | 20 -0.0065 |
| | age6 | | >36 -0.0153 | >16 -0.0271 | >20 -0.0044 | >20 -0.0099 | >20 0.0051 | >20 0.0357 | >20 0.0123 |
| Intercept term. | constant | 1 | -13.7766 | -8.3007 | -5.4327 | -0.0795 | -1.7257 | -13.5692 | -9.0642 |
| Estimation Sample Count | N | Total | | | | | | | |
| Log Likelihood (model) | L1 | | | | | | | | |
| Log Likelihood (constant) | L0 | | | | | | | | |
| Degrees of Freedom | d.f. | L1 - L0 parameters | | | | | | | |
| Chi-Squared Test Value | Chi-square | - 2*(L0-L1) | | | | | | | |

Note: All variables except age and duration linear spline segments are dummy (0/1) variables taking value 1 for the defined categorical outcome. Blank entries indicate that outcome is a member of baseline (omitted) category. Chi-square test is for signficance of estimated model versus constrained model with only a constant term included. The Chi-square test critical value with 100 degrees of freedom for 0.001-level test is 107.258, which is exceeded by all models for all products at fewer degress of freedom indicating a high level of statistical significance.

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

| Variable | | | Status Transition ( from_to ) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Description | Name | Values | current_ default | current_ prepay | default_ claim | default_ prepay | default_ cure_s | default_ cure_m | default_ cure_n |
| Prior default episode | prior_default | X = 0/1 | 2.3210 | -0.4527 | -0.3353 | -0.0783 | 0.1023 | 0.3386 | 0.2040 |
| LTV | ltv | Continuous from 50 to 110. | 0.0096 | 0.0008 | 0.1614 | -0.0250 | -0.0619 | -0.0041 | 0.0187 |
| | ltv_sq | | 0.0000 | 0.0000 | -0.0008 | 0.0001 | 0.0004 | 0.0001 | -0.0001 |
| Relative house price | rel_hp | Continuous from 0. | -0.0036 | 0.0049 | -0.0032 | 0.0010 | -0.0009 | 0.0091 | -0.0031 |
| | rel_hp_sq | | 0.000005 | -0.000010 | 0.000004 | 0.000000 | 0.000004 | -0.000020 | 0.000013 |
| Credit score. | credit_score | Continuous from 300 to 850. | 0.0363 | 0.0021 | -0.0100 | -0.0074 | 0.0040 | 0.0166 | 0.0200 |
| | credit_score_sq | | -0.000030 | 0.000000 | 0.000009 | 0.000007 | 0.000000 | -0.000010 | -0.000010 |
| Missing credit score. | credit_score_999 | X = 0/1 | 7.4530 | 0.7280 | -2.4626 | -0.6529 | 1.7370 | 3.2813 | 5.4513 |
| No credit score returned. | credit_score_000 | X = 0/1 | 7.4726 | 0.5292 | -2.4451 | -1.5776 | 1.3766 | 3.4361 | 5.4536 |
| Refinance loan. | refinance | X = 0/1 | -0.1090 | 0.1290 | -0.4699 | 0.0607 | -0.0337 | 0.2333 | 0.0170 |
| Unicon loan. | unicon_loan | X = 0/1 | 0.1559 | 0.0876 | 0.2939 | 1.0610 | 0.3152 | -0.7964 | -0.2296 |
| FHA underwriting changes. | fy_1996_2004 | X = 0/1 | 0.2748 | 0.0466 | -0.2303 | -0.0897 | -0.2138 | 1.5719 | 0.5482 |
| | fy_2005_XXXX | X = 0/1 | 0.6633 | -0.3270 | -0.4251 | -0.0295 | -0.3455 | 1.7948 | 0.0969 |
| Subprime expansion. | sp_2004_2006 | X = 0/1 | -0.1568 | 0.2125 | 0.3651 | 0.7989 | 0.2098 | 0.7059 | 1.0493 |
| Downpayment assistance type. | dpa_relative | X = 0/1 | 0.2536 | -0.0036 | -0.0899 | 0.0579 | 0.0090 | 0.3039 | 0.0161 |
| | dpa_nonprof | X = 0/1 | 0.6812 | 0.0483 | 0.3450 | -0.4805 | -0.2471 | 0.1911 | -0.1188 |
| | dpa_govt | X = 0/1 | 0.6594 | -0.2355 | 0.3676 | -1.0448 | -0.0844 | 0.5851 | -0.4192 |
| Probability of negative equity. Based on FHFA house price drift and volatility estimates. | pneq05 | X ≤ 0.05 | | | | | | | |
| | pneq10 | 0.05 < X ≤ 0.10 | 0.2052 | -0.3369 | 0.4131 | -0.8973 | -0.2246 | -0.0748 | -0.2891 |
| | pneq15 | 0.10 < X ≤ 0.15 | 0.3282 | -0.5568 | 0.4486 | -1.3349 | -0.3750 | -0.0446 | -0.6236 |
| | pneq20 | 0.15 < X ≤ 0.20 | 0.4397 | -0.6480 | 0.4514 | -1.5341 | -0.4157 | -0.3196 | -0.9067 |
| | pneq25 | 0.20 < X ≤ 0.25 | 0.5541 | -0.6705 | 0.5938 | -1.9938 | -0.5637 | -0.2460 | -0.5711 |
| | pneq30 | 0.25 < X ≤ 0.30 | 0.6446 | -0.6236 | 0.4297 | -1.9907 | -0.6644 | -0.0067 | -0.6028 |
| | pneq40 | 0.30 < X ≤ 0.40 | 0.6906 | -0.5728 | 0.5426 | -2.1399 | -0.9272 | -0.4306 | -1.2764 |
| | pneq50 | 0.40 < X ≤ 0.50 | 0.7755 | -0.5533 | 0.4639 | -1.9749 | -0.9972 | -0.4313 | -1.2339 |
| | pneq100 | 0.50 < X ≤ 1.00 | 0.6379 | -0.4500 | 0.0031 | -2.0155 | -0.6389 | -0.2283 | -0.8087 |
| Mortgage premium. Difference between current coupon rate and average FRM market rate, divided by current coupon rate. | relspread_00 | X ≤ 0 | | | | | | | |
| | relspread_10 | 0 <X ≤ 10 | 0.0760 | 0.2789 | 0.0989 | -0.0627 | -0.0102 | -0.1743 | 0.0579 |
| | relspread_20 | 10 < X ≤ 20 | 0.0933 | 0.7265 | 0.0504 | -0.0230 | -0.0686 | -0.1482 | -0.0822 |
| | relspread_30 | 20 < X ≤ 30 | 0.0775 | 1.0233 | 0.0153 | -0.1128 | -0.1247 | -0.1804 | -0.1773 |
| | relspread_40 | 30 < X | -0.2516 | 0.8340 | -0.0679 | -0.0952 | -0.3969 | -0.1405 | -0.2297 |
| Burnout factor. Moving average number of basis points prepayment option in the money over preceding 8 quarters. | in_money_00 | X ≤ 0 | | | | | | | |
| | in_money_50 | 0 < X ≤ 50 | 0.2219 | 0.4192 | -0.1491 | -0.0092 | 0.0171 | -0.1672 | -0.2754 |
| | in_money_100 | 50 < X ≤ 100 | 0.3764 | 0.3174 | -0.0771 | 0.0211 | 0.0252 | -0.1737 | -0.3202 |
| | in_money_150 | 100 < X ≤ 150 | 0.3793 | 0.1352 | -0.2165 | 0.0362 | 0.0503 | -0.1375 | -0.4017 |
| | in_money_200 | 150 < X ≤ 200 | 0.4318 | -0.0671 | -0.1357 | 0.0368 | 0.1749 | -0.3808 | -0.4442 |
| | in_money_250 | X > 200 | 0.6903 | -0.1732 | -0.0582 | 0.0660 | 0.2506 | -0.4183 | -0.4909 |
| Yield curve slope measured as ratio of 10_ year CMT to 1-year CMT rates. | ycslope_1 | X ≤ 1 | | | | | | | |
| | ycslope_1p2 | 1.0 < X ≤ 1.2 | 0.1141 | -0.0704 | -0.4118 | -0.1254 | -0.1497 | -0.3025 | -0.5138 |
| | ycslope_1p5 | 1.2 < X ≤ 1.5 | 0.0992 | -0.1793 | -0.4802 | -0.3389 | -0.2612 | -0.2201 | -0.0455 |
| | ycslope_2 | 1.5 < X ≤ 2.0 | 0.1825 | 0.0343 | -0.3134 | -0.3421 | -0.1315 | -0.2473 | -0.5434 |
| | ycslope_3 | X > 2.0 | 0.2050 | 0.0603 | -0.7813 | -0.3104 | -0.2559 | -0.2171 | -0.4951 |
| Season of year. | season_winter | X = 1 | | | | | | | |
| | season_spring | X = 2 | -0.0898 | 0.0196 | 0.0638 | 0.0435 | -0.0686 | 0.6072 | -0.0489 |
| | season_summer | X = 3 | 0.0466 | 0.0242 | 0.0071 | -0.0033 | -0.2186 | 0.4661 | 0.0801 |
| | season_fall | X = 4 | 0.0856 | -0.1608 | -0.0356 | -0.1964 | -0.0355 | -0.9737 | -1.5743 |
| Judicial foreclosure state. | judicial | X = 0/1 | 0.1154 | -0.1512 | | | | | |
| Default duration function for judicial foreclosure state. | judicial_01 | 0 ≤ X ≤ 1 | | | -0.6219 | -0.3270 | -0.2641 | -0.1999 | -0.2777 |
| | dur_dum_2_judicial | X = 2 | | | -0.3132 | -0.4654 | -1.0542 | 0.3237 | -0.1878 |
| | dur_dum_3_judicial | X = 3 | | | -0.0140 | -0.5918 | -1.2112 | 0.1850 | -0.1835 |
| | dur_dum_4_judicial | X = 4 | | | -0.0348 | -0.6629 | -0.8349 | -0.0659 | -0.4903 |
| | dur_dum_5_judicial | X ≥ 5 | | | -0.2765 | -0.6968 | -1.4055 | -0.6492 | -0.7603 |
| Default duration function for non-judicial foreclosure state. | dur_dum_2_non_jud | X = 2 | | | -0.2297 | -0.2870 | -0.7017 | 0.4469 | -0.0425 |
| | dur_dum_3_non_jud | X = 3 | | | -0.2256 | -0.6111 | -0.9276 | 0.3287 | 0.0088 |
| | dur_dum_4_non_jud | X = 4 | | | -0.2048 | -0.5912 | -0.6215 | 0.1696 | -0.1662 |
| | dur_dum_5_non_jud | X ≥ 5 | | | -0.5060 | -0.6572 | -1.2428 | -0.4488 | -0.5297 |
| Mortgage age function. Piece-wise linear spline for ages up to specified knot points (shown as the number of quarters since origination). | age1 | Age spline function knot values given in respective columns to the right next to the corresponding coefficient estimates. | 2 1.1037 | 40 -0.0049 | 8 0.0473 | 16 0.0187 | 36 0.0011 | 16 0.0404 | 16 0.0010 |
| | age2 | | 4 0.1614 | >40 0.0981 | 16 0.0124 | 36 0.0074 | >36 0.0072 | 36 0.0333 | 36 0.0193 |
| | age3 | | 8 0.0058 | | 36 -0.0318 | >36 0.0612 | | >36 0.0293 | >36 0.0195 |
| | age4 | | 16 -0.0069 | | >36 -0.0571 | | | | |
| | age5 | | 36 -0.0220 | | | | | | |
| | age6 | | >36 -0.0206 | | | | | | |
| Intercept term. | constant | 1 | -16.8562 | -5.3117 | -6.6812 | -1.1577 | 0.1447 | -9.8697 | -9.2725 |
| Estimation Sample Count | N | Total | | | | | | | |
| Log Likelihood (model) | L1 | | | | | | | | |
| Log Likelihood (constant) | L0 | | | | | | | | |
| Degrees of Freedom | d.f. | L1 - L0 parameters | | | | | | | |
| Chi-Squared Test Value | Chi-square | - 2*(L0-L1) | | | | | | | |

Note: All variables except age and duration linear spline segments are dummy (0/1) variables taking value 1 for the defined categorical outcome. Blank entries indicate that outcome is a member of baseline (omitted) category. Chi-square test is for signficance of estimated model versus constrained model with only a constant term included. The Chi-square test critical value with 100 degrees of freedom for 0.001-level test is 107.258, which is exceeded by all models for all products at fewer degress of freedom indicating a high level of statistical significance.

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

| Variable | | | Status Transition ( from_to ) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Description** | **Name** | **Values** | **current_ default** | **current_ prepay** | **default_ claim** | **default_ prepay** | **default_ cure_s** | **default_ cure_m** | **default_ cure_n** |
| Prior default episode | prior_default | X = 0/1 | 2.0874 | -0.6754 | -0.3674 | -0.0975 | 0.0404 | 0.3062 | 0.0894 |
| LTV | ltv | Continuous from 50 to 110. | -0.0362 | -0.0212 | 0.1799 | 0.0345 | -0.0233 | 0.0400 | -0.1233 |
| | ltv_sq | | 0.0003 | 0.0002 | -0.0010 | -0.0002 | 0.0001 | -0.0002 | 0.0007 |
| Relative house price | rel_hp | Continuous from 0. | -0.0057 | 0.0080 | -0.0099 | -0.0110 | 0.0003 | 0.0120 | -0.0006 |
| | rel_hp_sq | | 0.000018 | -0.000020 | 0.000043 | 0.000038 | 0.000000 | -0.000040 | 0.000005 |
| Credit score. | credit_score | Continuous from 300 to 850. | 0.0239 | 0.0088 | -0.0003 | -0.0029 | 0.0072 | 0.0175 | 0.0034 |
| | credit_score_sq | | -0.000020 | 0.000000 | 0.000001 | 0.000004 | 0.000000 | -0.000010 | 0.000000 |
| Missing credit score. | credit_score_999 | X = 0/1 | 4.9051 | 4.1407 | 0.2315 | 0.0917 | 2.4368 | 4.1581 | 0.4902 |
| No credit score returned. | credit_score_000 | X = 0/1 | 5.0584 | 3.8047 | 0.5661 | 0.1520 | 2.4057 | 4.5352 | 0.7711 |
| Refinance loan. | refinance | X = 0/1 | 0.0915 | 0.0797 | 0.1453 | 0.0108 | -0.0494 | 0.3483 | 0.1844 |
| Unicon loan. | unicon_loan | X = 0/1 | 0.4348 | 0.1411 | 0.2954 | -0.2499 | -0.2116 | -0.6246 | -0.6299 |
| FHA underwriting changes. | fy_1996_2004 | X = 0/1 | 0.4288 | 0.2243 | 0.0216 | -0.1126 | -0.1944 | 0.7178 | 0.3035 |
| | fy_2005_XXXX | X = 0/1 | 0.7029 | 0.2442 | -0.3852 | -0.9186 | -0.2509 | 0.5291 | 0.2952 |
| Subprime expansion. | sp_2004_2006 | X = 0/1 | -0.1864 | 0.1423 | 0.1033 | 0.8974 | 0.2957 | 0.3455 | 0.7619 |
| Downpayment assistance type. | dpa_relative | X = 0/1 | 0.2754 | -0.0582 | 0.0310 | 0.0980 | -0.0648 | 0.2179 | 0.0603 |
| | dpa_nonprof | X = 0/1 | 0.3825 | -0.2818 | 0.4928 | -0.3854 | -0.2689 | 0.4874 | 0.2582 |
| | dpa_govt | X = 0/1 | 0.3059 | -0.3268 | 0.4508 | -0.1000 | -0.2047 | 0.3361 | 0.0825 |
| Current mortgage rate level. | ey_rate | Continuous. | 1.6343 | 2.8090 | 1.3706 | 2.6521 | 0.5722 | 0.1417 | 4.4387 |
| | ey_rate_sq | | -0.1166 | -0.2239 | -0.1088 | -0.1954 | -0.0299 | -0.0508 | -0.3159 |
| Probability of negative equity. Based on FHFA house price drift and volatility estimates. | pneq05 | X ≤ 0.05 | | | | | | | |
| | pneq10 | 0.05 < X ≤ 0.10 | 0.1193 | -0.3329 | 0.3376 | -1.1464 | -0.1039 | 0.0944 | -0.2070 |
| | pneq15 | 0.10 < X ≤ 0.15 | 0.1647 | -0.5310 | 0.4438 | -1.4404 | -0.1184 | 0.1040 | -0.3252 |
| | pneq20 | 0.15 < X ≤ 0.20 | 0.2489 | -0.7138 | 0.5113 | -1.9632 | -0.1709 | 0.0850 | -0.4632 |
| | pneq25 | 0.20 < X ≤ 0.25 | 0.3612 | -0.7965 | 0.5223 | -2.0065 | -0.1662 | -0.0284 | -0.7828 |
| | pneq30 | 0.25 < X ≤ 0.30 | 0.4408 | -0.8915 | 0.6527 | -2.6256 | -0.1962 | -0.2481 | -0.9657 |
| | pneq40 | 0.30 < X ≤ 0.40 | 0.5757 | -1.0316 | 0.8670 | -2.6157 | -0.3835 | -0.1389 | -0.8246 |
| | pneq50 | 0.40 < X ≤ 0.50 | 0.6712 | -1.2129 | 1.1280 | -4.1839 | -0.6121 | -0.1493 | -1.9214 |
| | pneq100 | 0.50 < X ≤ 1.00 | 1.0226 | -1.2453 | 1.0395 | -3.1504 | -0.9457 | -0.1051 | -1.4985 |
| Mortgage premium. Difference between current coupon rate and average FRM market rate, divided by current coupon rate. | relspread_00 | X ≤ 0 | | | | | | | |
| | relspread_10 | 0 <X ≤ 10 | 0.1021 | 0.3745 | -0.0481 | -0.0612 | -0.0185 | -0.3077 | -0.0924 |
| | relspread_20 | 10 < X | 0.1868 | 0.6631 | -0.1460 | -0.0115 | -0.0206 | -0.2472 | 0.1076 |
| Burnout factor. Moving average number of basis points prepayment option in the money over preceding 8 quarters. | in_money_00 | X ≤ 0 | 0.3046 | 0.1643 | -0.0653 | -0.1740 | -0.1641 | 0.0789 | -0.1611 |
| | in_money_50 | 0 < X ≤ 50 | 0.3046 | 0.1643 | -0.0653 | -0.1740 | -0.1641 | 0.0789 | -0.1611 |
| | in_money_100 | 50 < X ≤ 100 | 0.7534 | 0.2201 | -0.1949 | -0.7899 | -0.4275 | 0.1099 | -0.9333 |
| | in_money_150 | 100 < X | 0.9120 | 0.2114 | -0.1747 | 1.5477 | -0.5189 | 0.3958 | -0.5506 |
| Yield curve slope measured as ratio of 10_ year CMT to 1-year CMT rates. | ycslope_1 | X ≤ 1 | | | | | | | |
| | ycslope_1p2 | 1.0 < X ≤ 1.2 | -0.0234 | -0.2823 | -0.2917 | -0.1023 | -0.0064 | -0.3066 | -0.5547 |
| | ycslope_1p5 | 1.2 < X ≤ 1.5 | -0.0226 | -0.1907 | -0.5812 | -0.0314 | -0.1041 | -0.6001 | -0.1327 |
| | ycslope_2 | 1.5 < X ≤ 2.0 | -0.0310 | -0.6382 | -0.4692 | -0.3777 | 0.0642 | -0.1468 | -0.5072 |
| | ycslope_3 | X > 2.0 | 0.1230 | -0.2884 | -0.6662 | -0.0651 | 0.1087 | -0.7313 | -0.0481 |
| Season of year. | season_winter | X = 1 | | | | | | | |
| | season_spring | X = 2 | -0.1154 | 0.0501 | 0.0252 | 0.0949 | -0.0386 | 0.3809 | -0.0677 |
| | season_summer | X = 3 | 0.0875 | 0.0757 | 0.0033 | 0.0618 | -0.1602 | 0.2387 | -0.0539 |
| | season_fall | X = 4 | 0.1583 | -0.0699 | -0.0365 | -0.1612 | 0.1743 | -1.6380 | -2.6617 |
| Judicial foreclosure state. | judicial | X = 0/1 | 0.0324 | -0.1894 | | | | | |
| Default duration function for judicial foreclosure state. | judicial_01 | 0 ≤ X ≤ 1 | | | -0.8275 | -0.5182 | -0.1542 | -0.1707 | -0.0648 |
| | dur_dum_2_judicial | X = 2 | | | -0.3737 | -0.6020 | -1.0162 | 0.3894 | -0.0204 |
| | dur_dum_3_judicial | X = 3 | | | 0.0109 | -0.9052 | -1.2997 | 0.2570 | -0.1967 |
| | dur_dum_4_judicial | X = 4 | | | 0.0816 | -0.9619 | -1.1304 | 0.1949 | -0.4854 |
| | dur_dum_5_judicial | X ≥ 5 | | | -0.1858 | -0.8115 | -1.7620 | -0.5613 | -1.0583 |
| Default duration function for non-judicial foreclosure state. | dur_dum_2_non_jud | X = 2 | | | 0.1803 | -0.3741 | -0.8477 | 0.5264 | 0.1273 |
| | dur_dum_3_non_jud | X = 3 | | | 0.0444 | -0.3788 | -1.1269 | 0.4480 | -0.0506 |
| | dur_dum_4_non_jud | X = 4 | | | -0.0419 | -0.4392 | -0.8731 | 0.2379 | -0.0310 |
| | dur_dum_5_non_jud | X ≥ 5 | | | -0.2815 | -0.5531 | -1.4207 | -0.4537 | -0.7265 |
| Mortgage age function. Piece-wise linear spline for ages up to specified knot points (shown as the number of quarters since origination). | age1 | Age spline function knot values given in respective columns to the right next to the corresponding coefficient estimates. | 2 1.2131 | 2 0.8718 | 8 0.1401 | 8 0.0618 | 16 0.0131 | 16 0.0374 | 16 0.0438 |
| | age2 | | 4 0.1239 | 4 0.2924 | 24 0.0088 | 20 0.0257 | 36 0.0105 | 36 0.0090 | 36 0.0252 |
| | age3 | | 8 0.0540 | 8 0.0096 | >24 -0.0093 | 40 0.0074 | >36 0.0034 | >36 0.0380 | >36 0.0052 |
| | age4 | | 12 0.0027 | 12 -0.0226 | | >40 -0.0173 | | | |
| | age5 | | 36 -0.0244 | 16 -0.0604 | | | | | |
| | age6 | | >36 -0.0138 | >16 -0.0160 | | | | | |
| Intercept term. | constant | 1 | -17.1087 | -17.3202 | -14.9477 | -12.4588 | -4.8598 | -10.0714 | -14.0509 |
| Estimation Sample Count | N | Total | | | | | | | |
| Log Likelihood (model) | L1 | | | | | | | | |
| Log Likelihood (constant) | L0 | | | | | | | | |
| Degrees of Freedom | d.f. | L1 - L0 parameters | | | | | | | |
| Chi-Squared Test Value | Chi-square | - 2*(L0-L1) | | | | | | | |

Note: All variables except age and duration linear spline segments are dummy (0/1) variables taking value 1 for the defined categorical outcome. Blank entries indicate that outcome is a member of baseline (omitted) category. Chi-square test is for signficance of estimated model versus constrained model with only a constant term included. The Chi-square test critical value with 100 degrees of freedom for 0.001-level test is 107.258, which is exceeded by all models for all products at fewer degress of freedom indicating a high level of statistical significance.

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

| Variable | | | Status Transition ( from_to ) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Description | Name | Values | current_ default | current_ prepay | default_ claim | default_ prepay | default_ cure_s | default_ cure_m | default_ cure_n |
| Prior default episode | prior_default | X = 0/1 | 2.0095 | -0.6995 | -0.2755 | -0.1740 | 0.1789 | 0.3849 | 0.1246 |
| LTV | ltv | Continuous from 50 to 110. | 0.0502 | 0.0067 | 0.1417 | -0.0281 | -0.0534 | 0.0010 | -0.0221 |
| | ltv_sq | | -0.0003 | 0.0000 | -0.0008 | 0.0001 | 0.0003 | 0.0000 | 0.0002 |
| Relative house price | rel_hp | Continuous from 0. | -0.0004 | 0.0048 | -0.0053 | -0.0069 | 0.0026 | 0.0074 | 0.0030 |
| | rel_hp_sq | | 0.000000 | -0.000010 | 0.000019 | 0.000018 | -0.000010 | -0.000020 | 0.000000 |
| Credit score. | credit_score | Continuous from 300 to 850. | 0.0253 | 0.0091 | -0.0070 | -0.0071 | 0.0089 | 0.0092 | 0.0210 |
| | credit_score_sq | | -0.000020 | 0.000000 | 0.000008 | 0.000007 | 0.000000 | -0.000010 | -0.000010 |
| Missing credit score. | credit_score_999 | X = 0/1 | 5.1389 | 3.5947 | -1.2686 | -0.6802 | 2.4473 | 0.9589 | 5.9902 |
| No credit score returned. | credit_score_000 | X = 0/1 | 5.5279 | 2.7750 | -0.6769 | -1.7529 | 2.2900 | 1.6093 | 5.5916 |
| Unicon loan. | unicon_loan | X = 0/1 | 0.0390 | 0.0547 | 0.1159 | 0.6137 | 0.0634 | -0.7460 | 0.2313 |
| FHA underwriting changes. | fy_1996_2004 | X = 0/1 | 0.5329 | 0.0403 | -0.0744 | -0.3657 | -0.3611 | 1.9154 | 0.2823 |
| | fy_2005_XXXX | X = 0/1 | 0.5966 | -0.0564 | -0.9571 | -0.0570 | -0.4114 | 1.9631 | 0.5697 |
| Subprime expansion. | sp_2004_2006 | X = 0/1 | 0.1138 | 0.2367 | 0.3624 | 1.0998 | 0.0931 | 0.6706 | 0.9362 |
| Downpayment assistance type. | dpa_relative | X = 0/1 | 0.1834 | 0.0634 | -0.0069 | 0.0106 | -0.0468 | 0.1251 | 0.0426 |
| | dpa_nonprof | X = 0/1 | 0.3667 | -0.0363 | 0.2154 | -0.3218 | -0.2386 | 0.1613 | -0.2063 |
| | dpa_govt | X = 0/1 | 0.3172 | -0.1678 | 0.1662 | -0.5198 | -0.1782 | 0.2495 | -0.2649 |
| loans with appraisal value | appraisal_req | X = 0/1 | 0.0576 | -0.1698 | -0.0635 | -0.1826 | -0.0041 | -0.0232 | 0.0552 |
| prior product type before refinancing | prior_prod_2 | X = 0/1 | 0.1767 | 0.0312 | 0.3270 | -0.1825 | -0.1123 | -0.1159 | 0.0080 |
| | prior_prod_3 | X = 0/1 | -0.0442 | 0.2061 | 0.0006 | 0.2932 | 0.0468 | -0.3106 | 0.0218 |
| | prior_prod_4 | X = 0/1 | 0.0665 | 0.2359 | 0.0222 | -0.0202 | -0.1399 | 0.1845 | -0.0330 |
| | prior_prod_5 | X = 0/1 | 0.0174 | 0.0124 | -0.0584 | 0.1395 | 0.0525 | 0.1622 | -0.1437 |
| | prior_prod_6 | X = 0/1 | 0.2240 | 0.3633 | 0.1262 | -0.0024 | -0.1374 | -0.0233 | 0.1347 |
| Probability of negative equity. Based on FHFA house price drift and volatility estimates. | pneq05 | X ≤ 0.05 | | | | | | | |
| | pneq10 | 0.05 < X ≤ 0.10 | | | | | | | |
| | pneq15 | 0.10 < X ≤ 0.15 | 0.3539 | -0.5325 | 0.7259 | -1.9375 | -0.3935 | -0.0087 | -0.4809 |
| | pneq20 | 0.15 < X ≤ 0.20 | 0.4124 | -0.6022 | 0.7625 | -2.2492 | -0.5251 | -0.0171 | -0.6352 |
| | pneq25 | 0.20 < X ≤ 0.25 | 0.4857 | -0.6881 | 0.8421 | -2.4827 | -0.6114 | -0.1513 | -0.7760 |
| | pneq30 | 0.25 < X ≤ 0.30 | 0.5408 | -0.8656 | 0.8420 | -2.3905 | -0.6760 | -0.1055 | -0.7532 |
| | pneq40 | 0.30 < X ≤ 0.40 | 0.6398 | -1.0564 | 0.9764 | -3.0337 | -0.8244 | -0.1238 | -1.0259 |
| | pneq50 | 0.40 < X ≤ 0.50 | 0.7889 | -1.1164 | 0.9736 | -2.9837 | -0.9876 | -0.0660 | -0.9172 |
| | pneq100 | 0.50 < X ≤ 1.00 | 1.1135 | -1.1377 | 0.9702 | -3.0173 | -1.2773 | -0.2046 | -1.5311 |
| Mortgage premium. Difference between current coupon rate and average FRM market rate, divided by current coupon rate. | relspread_00 | X ≤ 0 | | | | | | | |
| | relspread_10 | X ≤ 10 | 0.1981 | 0.2929 | -0.0018 | 0.0446 | -0.0238 | -0.1381 | -0.1329 |
| | relspread_20 | 10 < X ≤ 20 | 0.2881 | 0.8378 | -0.0475 | 0.0999 | -0.0909 | -0.2094 | -0.2645 |
| | relspread_30 | 20 < X ≤ 30 | 0.2731 | 0.9758 | -0.0078 | 0.1003 | -0.1410 | -0.1973 | -0.4075 |
| | relspread_40 | 30 < X | -0.1244 | 0.7415 | 0.2444 | -0.0268 | -0.3239 | -0.1027 | -0.6071 |
| Burnout factor. Moving average number of basis points prepayment option in the money over preceding 8 quarters. | in_money_00 | X ≤ 0 | -0.0125 | 0.1918 | -0.0211 | 0.0364 | 0.0769 | -0.0246 | -0.0701 |
| | in_money_50 | 0 < X ≤ 50 | -0.0125 | 0.1918 | -0.0211 | 0.0364 | 0.0769 | -0.0246 | -0.0701 |
| | in_money_100 | 50 < X ≤ 100 | 0.0296 | 0.4222 | 0.0168 | 0.1114 | 0.1229 | -0.0341 | -0.0942 |
| | in_money_150 | 100 < X ≤ 150 | 0.1422 | 0.4786 | -0.0166 | 0.1851 | 0.1377 | -0.2284 | -0.0995 |
| | in_money_200 | 150 < X ≤ 200 | 0.2523 | 0.4501 | -0.1745 | 0.1839 | 0.1951 | -0.3539 | -0.1165 |
| | in_money_250 | X > 200 | 0.4163 | 0.4852 | -0.2541 | 0.2330 | 0.2862 | -0.4860 | -0.2506 |
| Yield curve slope measured as ratio of 10_ year CMT to 1-year CMT rates. | ycslope_1 | X ≤ 1 | | | | | | | |
| | ycslope_1p2 | 1.0 < X ≤ 1.2 | -0.0540 | -0.1624 | -0.2393 | -0.3158 | 0.0092 | -0.1742 | -0.3480 |
| | ycslope_1p5 | 1.2 < X ≤ 1.5 | -0.1958 | -0.0096 | -0.3169 | -0.3357 | -0.2582 | -0.0089 | 0.1309 |
| | ycslope_2 | 1.5 < X ≤ 2.0 | 0.0831 | 0.0997 | -0.3021 | -0.4557 | 0.1182 | -0.2677 | -0.5568 |
| | ycslope_3 | X > 2.0 | 0.0865 | 0.4057 | -0.6122 | -0.3769 | -0.1421 | -0.1065 | -0.3681 |
| Season of year. | season_winter | X = 1 | | | | | | | |
| | season_spring | X = 2 | -0.0943 | 0.1821 | -0.0065 | 0.2508 | -0.1606 | 0.4826 | -0.0462 |
| | season_summer | X = 3 | 0.0503 | 0.1506 | 0.0151 | 0.2447 | -0.3445 | 0.4225 | 0.0992 |
| | season_fall | X = 4 | 0.0220 | 0.1252 | 0.0238 | 0.0532 | 0.0101 | -1.0504 | -1.3584 |
| Judicial foreclosure state. | judicial | X = 0/1 | 0.0107 | -0.1833 | | | | | |
| Default duration function for judicial foreclosure state. | judicial_01 | 0 ≤ X ≤ 1 | | | -0.7192 | -0.3279 | -0.1368 | -0.0765 | -0.0976 |
| | dur_dum_2_judicial | X = 2 | | | -0.3436 | -0.5675 | -0.7345 | 0.2177 | -0.2277 |
| | dur_dum_3_judicial | X = 3 | | | 0.3847 | -0.6207 | -0.9728 | 0.1836 | -0.3218 |
| | dur_dum_4_judicial | X = 4 | | | 0.7083 | -0.7567 | -0.8408 | 0.0202 | -0.5022 |
| | dur_dum_5_judicial | X ≥ 5 | | | 0.5891 | -0.7694 | -1.1771 | -0.5565 | -0.7485 |
| Default duration function for non-judicial foreclosure state. | dur_dum_2_non_jud | X = 2 | | | 0.7735 | -0.2532 | -0.6020 | 0.4110 | 0.0159 |
| | dur_dum_3_non_jud | X = 3 | | | 0.8545 | -0.4445 | -0.7377 | 0.2845 | -0.0487 |
| | dur_dum_4_non_jud | X = 4 | | | 0.7852 | -0.4319 | -0.6037 | 0.1297 | 0.0059 |
| | dur_dum_5_non_jud | X ≥ 5 | | | 0.3936 | -0.5432 | -0.9640 | -0.4365 | -0.4307 |
| Mortgage age function. Piece-wise linear spline for ages up to specified knot points (shown as the number of quarters since origination). | age1 | Age spline function knot values given in respective columns to the right next to the corresponding coefficient estimates. | 2 1.3325 | 2 0.9515 | 4 0.2337 | 4 -0.0976 | 4 -0.1018 | 4 0.7705 | 4 0.2151 |
| | age2 | | 4 0.0922 | 4 0.0575 | 8 0.0343 | 8 -0.0054 | 8 0.0056 | 8 0.0948 | 8 -0.0302 |
| | age3 | | 8 0.0193 | 8 -0.0022 | 12 -0.0005 | 12 0.0048 | 12 -0.0168 | 12 0.0040 | 12 0.0080 |
| | age4 | | 12 0.0165 | 12 -0.0498 | 16 0.0268 | 16 0.0371 | 16 0.0155 | 16 0.0299 | 16 0.0110 |
| | age5 | | 36 -0.0192 | 16 -0.0186 | 20 -0.0170 | 20 -0.0571 | 20 -0.0264 | 20 0.0549 | 20 -0.0155 |
| | age6 | | >36 -0.0139 | >16 -0.0339 | >20 -0.0101 | >20 -0.0062 | >20 0.0035 | >20 0.0437 | >20 0.0224 |
| Intercept term. | constant | 1 | -15.9825 | -10.3485 | -8.2858 | 0.6097 | -0.7972 | -10.4448 | -9.3384 |
| Estimation Sample Count | N | Total | | | | | | | |
| Log Likelihood (model) | L1 | | | | | | | | |
| Log Likelihood (constant) | L0 | | | | | | | | |
| Degrees of Freedom | d.f. | L1 - L0 parameters | | | | | | | |
| Chi-Squared Test Value | Chi-square | - 2*(L0-L1) | | | | | | | |

Note: All variables except age and duration linear spline segments are dummy (0/1) variables taking value 1 for the defined categorical outcome. Blank entries indicate that outcome is a member of baseline (omitted) category. Chi-square test is for signficance of estimated model versus constrained model with only a constant term included. The Chi-square test critical value with 100 degrees of freedom for 0.001-level test is 107.258, which is exceeded by all models for all products at fewer degress of freedom indicating a high level of statistical significance.

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

| Variable | | | Status Transition ( from_to ) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Description | Name | Values | current_ | current_ | default_ | default_ | default_ | default_ | default_ |
| Prior default episode | prior_default | X = 0/1 | 2.8711 | -0.3426 | -0.3924 | -0.2139 | 0.1675 | 0.2676 | 0.1687 |
| LTV | ltv | Continuous from 50 to 110. | 0.0069 | -0.0084 | 0.0044 | 0.0575 | 0.0379 | 0.0542 | 0.0131 |
| | ltv_sq | | 0.0000 | 0.0001 | 0.0001 | -0.0004 | -0.0003 | -0.0002 | 0.0000 |
| Relative house price | rel_hp | Continuous from 0. | -0.0029 | 0.0019 | -0.0151 | 0.0019 | 0.0002 | 0.0040 | 0.0037 |
| | rel_hp_sq | | 0.000003 | 0.000000 | 0.000046 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| Credit score. | credit_score | Continuous from 300 to 850. | 0.0323 | 0.0064 | -0.0021 | -0.0030 | 0.0083 | 0.0005 | 0.0080 |
| | credit_score_sq | | -0.000030 | 0.000000 | 0.000005 | 0.000004 | 0.000000 | 0.000000 | 0.000000 |
| Missing credit score. | credit_score_999 | X = 0/1 | 7.0623 | 2.0605 | 14.0050 | -0.6648 | 2.3307 | -1.9282 | 1.6842 |
| No credit score returned. | credit_score_000 | X = 0/1 | 7.3160 | 1.7718 | 1.1655 | -0.0723 | 2.4357 | -1.2641 | 2.1247 |
| Unicon loan. | unicon_loan | X = 0/1 | -0.0919 | -0.0936 | 13.5034 | -0.5217 | -0.0441 | -0.8783 | -0.1277 |
| FHA underwriting changes. | fy_1996_2004 | X = 0/1 | 0.2300 | -0.2153 | -0.1602 | -0.3051 | -0.1578 | 1.7347 | 0.4293 |
| | fy_2005_XXXX | X = 0/1 | 0.4039 | -0.6538 | 12.4341 | -1.6056 | -0.5560 | 1.9375 | 0.2199 |
| Subprime expansion. | sp_2004_2006 | X = 0/1 | -0.0203 | 0.2042 | 0.1098 | 0.9060 | 0.2830 | 1.1031 | 0.9077 |
| Downpayment assistance type. | dpa_relative | X = 0/1 | 0.3327 | 0.2483 | 0.4842 | -0.1816 | -0.2355 | 0.1315 | -0.0518 |
| | dpa_nonprof | X = 0/1 | 0.4971 | 0.2308 | 0.8399 | -0.1059 | -0.5793 | 0.4343 | 0.0284 |
| | dpa_govt | X = 0/1 | 0.5178 | 0.0378 | 1.1140 | -0.5167 | -0.1842 | 0.6594 | -0.2768 |
| loans with appraisal value | appraisal_req | X = 0/1 | 0.0638 | 0.0498 | 0.1410 | -0.1244 | -0.1121 | 0.0157 | 0.1271 |
| prior product type before refinancing | prior_prod_2 | X = 0/1 | 0.1070 | 0.3158 | 0.3977 | 0.1706 | -0.0903 | 0.0126 | -0.0808 |
| | prior_prod_3 | X = 0/1 | -0.0766 | 0.4066 | 0.2393 | 0.0965 | -0.3347 | 0.2578 | -0.1764 |
| | prior_prod_4 | X = 0/1 | -0.1529 | 0.2331 | 0.1961 | 0.1254 | -0.2397 | 0.2471 | -0.4497 |
| | prior_prod_5 | X = 0/1 | 0.0220 | 0.3853 | 0.5315 | 0.0505 | -0.1237 | -0.0562 | -0.0805 |
| | prior_prod_6 | X = 0/1 | -0.0043 | 0.5152 | 0.1671 | 0.0029 | -0.0460 | -0.8932 | -0.0278 |
| Probability of negative equity. Based on FHFA house price drift and volatility estimates. | pneq05 | X ≤ 0.05 | | | | | | | |
| | pneq10 | 0.05 < X ≤ 0.10 | 0.2149 | -0.3925 | 0.5343 | -0.9643 | -0.3252 | 0.0049 | -0.5362 |
| | pneq15 | 0.10 < X ≤ 0.15 | 0.1988 | -0.5711 | 0.4447 | -1.5552 | -0.3067 | -0.2099 | -1.0478 |
| | pneq20 | 0.15 < X ≤ 0.20 | 0.3680 | -0.7162 | 0.7269 | -1.6449 | -0.5409 | -0.9185 | -1.1211 |
| | pneq25 | 0.20 < X ≤ 0.25 | 0.3920 | -0.7538 | 0.6150 | -1.6755 | -0.3816 | -0.7883 | -1.3863 |
| | pneq30 | 0.25 < X ≤ 0.30 | 0.3082 | -0.8251 | 0.6207 | -1.8006 | -0.6622 | 0.0261 | -1.4589 |
| | pneq40 | 0.30 < X ≤ 0.40 | 0.4926 | -0.8757 | 0.9236 | -2.4698 | -0.6968 | -0.0567 | -1.5104 |
| | pneq50 | 0.40 < X ≤ 0.50 | 0.3908 | -0.7472 | 0.7614 | -1.8668 | -0.5481 | 0.1798 | -28.1402 |
| | pneq100 | 0.50 < X ≤ 1.00 | 0.6291 | -0.4011 | 0.4546 | -2.3015 | -1.2067 | -0.0970 | -0.1248 |
| Mortgage premium. Difference between current coupon rate and average FRM market rate, divided by current coupon rate. | relspread_00 | X ≤ 0 | | | | | | | |
| | relspread_10 | X ≤ 10 | 0.1475 | 0.1416 | -0.0342 | 0.0541 | 0.0512 | -0.1119 | 0.0735 |
| | relspread_20 | 10 < X ≤ 20 | 0.2348 | 0.3255 | -0.0139 | 0.0736 | 0.1079 | 0.0774 | 0.0706 |
| | relspread_30 | 20 < X ≤ 30 | 0.3003 | 0.4682 | -0.0726 | 0.0389 | 0.1512 | 0.1132 | 0.1015 |
| | relspread_40 | 30 < X | 0.1667 | 0.4063 | -0.0726 | 0.0389 | 0.1807 | 0.4862 | 0.0584 |
| Burnout factor. Moving average number of basis points prepayment option in the money over preceding 8 quarters. | in_money_00 | 0 < X ≤ 0 | | | | | | | |
| | in_money_50 | X ≤ 50 | 0.1361 | 0.3024 | 0.0448 | 0.0146 | 0.0142 | -0.3256 | -0.3103 |
| | in_money_100 | 50 < X ≤ 100 | 0.1999 | 0.4047 | -0.0230 | 0.0257 | -0.0228 | -0.7130 | -0.4088 |
| | in_money_150 | 100 < X ≤ 150 | 0.3201 | 0.3378 | -0.0412 | -0.0277 | -0.0804 | -1.0449 | -0.4738 |
| | in_money_200 | 150 < X ≤ 200 | 0.3111 | 0.1437 | 0.0417 | -0.1172 | -0.0921 | -1.2941 | -0.6512 |
| | in_money_250 | X > 200 | 0.4301 | 0.0369 | 0.0480 | -0.0728 | -0.1399 | -1.4347 | -0.8075 |
| Yield curve slope measured as ratio of 10_year CMT to 1-year CMT rates. | ycslope_1 | X ≤ 1 | | | | | | | |
| | ycslope_1p2 | 1.0 < X ≤ 1.2 | 0.2478 | -0.0010 | -0.2710 | -0.5271 | -0.2053 | -0.5240 | -0.6177 |
| | ycslope_1p5 | 1.2 < X ≤ 1.5 | 0.1839 | 0.1974 | -0.4473 | -0.6241 | -0.4206 | -0.2870 | -0.1175 |
| | ycslope_2 | 1.5 < X ≤ 2.0 | 0.2155 | 0.3585 | -0.3935 | -0.4859 | -0.1896 | -0.4513 | -0.6523 |
| | ycslope_3 | X > 2.0 | 0.2891 | 0.5102 | -0.6702 | -0.6175 | -0.4386 | -0.2936 | -0.5125 |
| Season of year. | season_winter | X = 1 | | | | | | | |
| | season_spring | X = 2 | -0.0258 | 0.1706 | 0.0176 | 0.2283 | 0.0017 | 0.5827 | 0.1159 |
| | season_summer | X = 3 | 0.0524 | 0.1609 | 0.0528 | 0.1504 | -0.0892 | 0.6215 | 0.1827 |
| | season_fall | X = 4 | 0.2530 | 0.0723 | -0.0351 | 0.0638 | 0.1212 | -0.5203 | -1.1072 |
| Judicial foreclosure state. | judicial | X = 0/1 | 0.1626 | -0.0821 | | | | | |
| Default duration function for judicial foreclosure state. | judicial_01 | 0 ≤ X ≤ 1 | | | -0.6872 | -0.2529 | -0.2004 | -0.1059 | -0.1419 |
| | dur_dum_2_judicial | X = 2 | | | -0.0035 | -0.6145 | -0.9108 | 0.4276 | -0.3023 |
| | dur_dum_3_judicial | X = 3 | | | 0.5689 | -0.5549 | -1.1219 | 0.2145 | -0.1339 |
| | dur_dum_4_judicial | X = 4 | | | 1.0004 | -0.6075 | -0.6952 | 0.0786 | -0.2284 |
| | dur_dum_5_judicial | X ≥ 5 | | | 0.7648 | -1.1148 | -1.4331 | -0.2958 | -0.5164 |
| Default duration function for non-judicial foreclosure state. | dur_dum_2_non_jud | X = 2 | | | 0.6686 | -0.3090 | -0.6899 | 0.4162 | 0.1412 |
| | dur_dum_3_non_jud | X = 3 | | | 0.6242 | -0.5280 | -0.9199 | 0.3133 | -0.0748 |
| | dur_dum_4_non_jud | X = 4 | | | 0.5186 | -0.6649 | -0.5271 | 0.0472 | -0.2483 |
| | dur_dum_5_non_jud | X ≥ 5 | | | 0.3507 | -0.8871 | -1.2154 | -0.1952 | -0.3719 |
| Mortgage age function. Piece-wise linear spline for ages up to specified knot points (shown as the number of quarters since origination). | age1 | Age spline function knot values given in respective columns to the right next to the corresponding coefficient estimates. | 12 0.0749 | 12 0.1002 | 12 0.0460 | 12 0.0450 | 12 -0.0196 | 12 0.0879 | 12 0.0401 |
| | age2 | | 24 -0.0316 | 24 -0.0179 | 24 -0.0389 | 24 0.0041 | 24 -0.0028 | 24 0.0306 | 24 0.0044 |
| | age3 | | 48 -0.0335 | 40 -0.0237 | 40 -0.0310 | 40 0.0077 | 40 0.0063 | 40 0.0366 | 40 0.0451 |
| | age4 | | >48 -0.0318 | >40 0.1151 | >40 -0.0086 | >40 0.0785 | >40 -0.0055 | >40 0.0548 | >40 0.0150 |
| | age5 | | | | | | | | |
| | age6 | | | | | | | | |
| Intercept term. | constant | 1 | -15.0837 | -7.0667 | -17.3647 | -4.0676 | -4.1012 | -7.7111 | -6.5522 |
| Estimation Sample Count | N | Total | | | | | | | |
| Log Likelihood (model) | L1 | | | | | | | | |
| Log Likelihood (constant) | L0 | | | | | | | | |
| Degrees of Freedom | d.f. | L1 - L0 parameters | | | | | | | |
| Chi-Squared Test Value | Chi-square | - 2*(L0-L1) | | | | | | | |

Note: All variables except age and duration linear spline segments are dummy (0/1) variables taking value 1 for the defined categorical outcome. Blank entries indicate that outcome is a member of baseline (omitted) category. Chi-square test is for signficance of estimated model versus constrained model with only a constant term included. The Chi-square test critical value with 100 degrees of freedom for 0.001-level test is 107.258, which is exceeded by all models for all products at fewer degress of freedom indicating a high level of statistical significance.

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

| Variable | | | Status Transition ( from_to ) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Description | Name | Values | current_ default | current_ prepay | default_ claim | default_ prepay | default_ cure_s | default_ cure_m | default_ cure_n |
| Prior default episode | prior_default | X = 0/1 | 1.6852 | -0.6493 | -0.1087 | -0.1591 | 0.2012 | 0.4083 | 0.1599 |
| LTV | ltv | Continuous from 50 to 110. | 0.1985 | -0.1025 | 0.1550 | -0.2447 | -0.0634 | 0.2117 | 0.0454 |
| | ltv_sq | | -0.0011 | 0.0007 | -0.0009 | 0.0014 | 0.0004 | -0.0012 | -0.0002 |
| Relative house price | rel_hp | Continuous from 0. | -0.0027 | 0.0011 | -0.0059 | -0.0141 | 0.0025 | 0.0119 | 0.0073 |
| | rel_hp_sq | | 0.000008 | 0.000000 | 0.000021 | 0.000054 | 0.000000 | -0.000040 | -0.000030 |
| Credit score. | credit_score | Continuous from 300 to 850. | 0.0183 | 0.0089 | -0.0021 | -0.0064 | 0.0075 | 0.0144 | 0.0163 |
| | credit_score_sq | | -0.000020 | 0.000000 | 0.000004 | 0.000006 | 0.000000 | -0.000010 | -0.000010 |
| Missing credit score. | credit_score_999 | X = 0/1 | 3.2960 | 3.6257 | -0.0793 | -1.9686 | 2.2583 | 2.8872 | 5.5153 |
| No credit score returned. | credit_score_000 | X = 0/1 | 3.5203 | 2.9121 | 0.6428 | -1.7271 | 2.1072 | 3.1326 | 4.0531 |
| Unicon loan. | unicon_loan | X = 0/1 | 0.0370 | -0.0417 | -0.1300 | -0.5202 | 0.1174 | -0.1940 | 1.2060 |
| FHA underwriting changes. | fy_1996_2004 | X = 0/1 | 0.7071 | 0.5275 | -0.1827 | 0.1409 | -0.1814 | 1.1518 | 0.3256 |
| | fy_2005_XXXX | X = 0/1 | 0.6710 | 0.6928 | -0.9457 | -0.5064 | 0.0714 | 1.2066 | 2.2384 |
| Subprime expansion. | sp_2004_2006 | X = 0/1 | -0.2084 | -0.0209 | 0.0100 | 1.1130 | 0.2368 | 0.3177 | 0.9730 |
| Downpayment assistance type. | dpa_relative | X = 0/1 | 0.1406 | -0.0318 | -0.0419 | 0.0298 | 0.0754 | 0.0603 | -0.0063 |
| | dpa_nonprof | X = 0/1 | 0.3778 | -0.1806 | 0.3100 | -0.2850 | -0.1343 | 0.0193 | -0.0539 |
| | dpa_govt | X = 0/1 | 0.2841 | -0.2398 | 0.3845 | -0.4662 | -0.1378 | 0.2343 | -0.0729 |
| Current mortgage rate level. | ey_rate | Continuous. | 1.7049 | 3.6386 | 1.4570 | 3.4456 | -0.2484 | -0.5559 | 3.6859 |
| | ey_rate_sq | | -0.1318 | -0.2792 | -0.1274 | -0.2384 | 0.0317 | -0.0048 | -0.2703 |
| Probability of negative equity. Based on FHFA house price drift and volatility estimates. | pneq05 | X ≤ 0.05 | | | | | | | |
| | pneq10 | 0.05 < X ≤ 0.10 | 0.2595 | -0.3848 | 0.5227 | -1.4484 | -0.2640 | 0.0629 | -0.2686 |
| | pneq15 | 0.10 < X ≤ 0.15 | 0.4000 | -0.5213 | 0.7308 | -1.8861 | -0.3660 | -0.0290 | -0.4338 |
| | pneq20 | 0.15 < X ≤ 0.20 | 0.4456 | -0.5200 | 0.7864 | -2.1990 | -0.3901 | -0.1478 | -0.8114 |
| | pneq25 | 0.20 < X ≤ 0.25 | 0.5204 | -0.5791 | 0.7830 | -2.4949 | -0.4502 | -0.2402 | -0.7523 |
| | pneq30 | 0.25 < X ≤ 0.30 | 0.5766 | -0.7134 | 0.7036 | -2.4397 | -0.7275 | -0.1365 | -1.1006 |
| | pneq40 | 0.30 < X ≤ 0.40 | 0.7217 | -0.9424 | 0.8683 | -2.8059 | -0.7772 | -0.4458 | -1.0716 |
| | pneq50 | 0.40 < X ≤ 0.50 | 1.0305 | -1.1968 | 0.9366 | -4.1720 | -1.2561 | -0.4172 | -1.6214 |
| | pneq100 | 0.50 < X ≤ 1.00 | 1.4198 | -1.1993 | 0.9362 | -3.8268 | -1.4629 | -0.6240 | -1.5546 |
| Mortgage premium. Difference between current coupon rate and average FRM market rate, divided by current coupon rate. | relspread_00 | X ≤ 0 | | | | | | | |
| | relspread_10 | 0 <X ≤ 10 | 0.0668 | 0.1163 | -0.0824 | 0.1152 | 0.0453 | -0.2251 | -0.0817 |
| | relspread_20 | 10 < X | 0.1434 | 0.2447 | -0.0180 | -0.0610 | 0.0127 | -0.1038 | 0.2339 |
| Burnout factor. Moving average number of basis points prepayment option in the money over preceding 8 quarters. | in_money_00 | X ≤ 0 | | | | | | | |
| | in_money_50 | 0 < X ≤ 50 | 0.1630 | 0.1255 | -0.0435 | -0.0827 | -0.0972 | 0.1607 | -0.0022 |
| | in_money_100 | 50 < X | | | | | | | |
| Yield curve slope measured as ratio of 10_year CMT to 1-year CMT rates. | ycslope_1 | X ≤ 1 | | | | | | | |
| | ycslope_1p2 | 1.0 < X ≤ 1.2 | 0.0449 | 0.0368 | -0.7470 | -0.3893 | -0.0590 | -0.7126 | -0.5647 |
| | ycslope_1p5 | 1.2 < X ≤ 1.5 | 0.2212 | 0.0618 | -1.1133 | -0.4499 | -0.3455 | -0.8285 | -0.2871 |
| | ycslope_2 | 1.5 < X ≤ 2.0 | 0.1921 | -0.3129 | -1.0744 | -0.6448 | -0.0389 | -0.8231 | -1.2791 |
| | ycslope_3 | X > 2.0 | 0.1862 | -0.1325 | -1.4991 | -0.4983 | -0.1436 | -1.2583 | -0.5099 |
| Season of year. | season_winter | X = 1 | | | | | | | |
| | season_spring | X = 2 | -0.0205 | 0.2055 | 0.1977 | 0.2091 | -0.0092 | 0.7395 | 0.1155 |
| | season_summer | X = 3 | 0.1076 | 0.1911 | 0.2023 | 0.2627 | -0.1427 | 0.6730 | 0.1605 |
| | season_fall | X = 4 | 0.2409 | 0.0904 | 0.1003 | -0.0383 | 0.2851 | -0.5844 | -1.4450 |
| Judicial foreclosure state. | judicial | X = 0/1 | -0.0251 | -0.1306 | | | | | |
| Default duration function for judicial foreclosure state. | judicial_01 | 0 ≤ X ≤ 1 | | | -0.4118 | -0.1968 | -0.0215 | 0.0151 | -0.0313 |
| | dur_dum_2_judicial | X = 2 | | | -0.6450 | -0.5895 | -0.7890 | 0.3600 | -0.1798 |
| | dur_dum_3_judicial | X = 3 | | | 0.2353 | -0.5752 | -0.9197 | 0.1614 | -0.3924 |
| | dur_dum_4_judicial | X = 4 | | | 0.5778 | -0.7106 | -0.8029 | 0.1376 | -0.3916 |
| | dur_dum_5_judicial | X ≥ 5 | | | 0.5224 | -0.6043 | -1.2795 | -0.3986 | -0.7611 |
| Default duration function for non-judicial foreclosure state. | dur_dum_2_non_jud | X = 2 | | | 0.8054 | -0.1973 | -0.6745 | 0.3731 | -0.0144 |
| | dur_dum_3_non_jud | X = 3 | | | 0.8943 | -0.2440 | -0.8121 | 0.4722 | 0.0788 |
| | dur_dum_4_non_jud | X = 4 | | | 0.7448 | -0.4322 | -0.6539 | 0.1345 | -0.0246 |
| | dur_dum_5_non_jud | X ≥ 5 | | | 0.4207 | -0.4642 | -0.9684 | -0.3783 | -0.5703 |
| Mortgage age function. Piece-wise linear spline for ages up to specified knot points (shown as the number of quarters since origination). | age1 | Age spline function knot values given in respective columns to the right next to the corresponding coefficient | 4 0.4733 | 4 0.5016 | 8 0.1270 | 8 0.0059 | 16 -0.0048 | 16 0.0011 | 16 0.0088 |
| | age2 | | 8 -0.0065 | 8 -0.0760 | 24 0.0019 | 20 0.0116 | 36 0.0157 | 36 0.0085 | 36 0.0251 |
| | age3 | | 16 0.0053 | 16 -0.0407 | >24 -0.0247 | 40 0.0309 | >36 0.0067 | >36 0.0270 | >36 0.0044 |
| | age4 | | 36 -0.0332 | 36 0.0102 | | >40 -0.0017 | | | |
| | age5 | | >36 -0.0095 | >36 -0.0245 | | | | | |
| | age6 | | | | | | | | |
| Intercept term. | constant | 1 | -24.5046 | -16.0537 | -12.8948 | -1.3584 | -0.7156 | -13.6815 | -23.7192 |
| Estimation Sample Count | N | Total | | | | | | | |
| Log Likelihood (model) | L1 | | | | | | | | |
| Log Likelihood (constant) | L0 | | | | | | | | |
| Degrees of Freedom | d.f. | L1 - L0 parameters | | | | | | | |
| Chi-Squared Test Value | Chi-square | - 2*(L0-L1) | | | | | | | |

Note: All variables except age and duration linear spline segments are dummy (0/1) variables taking value 1 for the defined categorical outcome. Blank entries indicate that outcome is a member of baseline (omitted) category. Chi-square test is for signficance of estimated model versus constrained model with only a constant term included. The Chi-square test critical value with 100 degrees of freedom for 0.001-level test is 107.258, which is exceeded by all models for all products at fewer degress of freedom indicating a high level of statistical significance.

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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 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 FY 2011) 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 (FY 2012 through FY 2018) 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, E and F. 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 LTV ratio, credit score, refinancing incentive, relative house price, probability of negative equity, loan term, burnout, and other characteristics. The models also used data on serious delinquency probabilities and their projections. Using detailed loan-level characteristics, we estimated the prepayment and claim probabilities and then generated respective cash flows for individual loans (Appendix A). We also 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, we also 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.

**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 later | 1 | 1 |

[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%<br>0.55% if LTV > 95%<br>until loan balance reaches 78% of original property value | | 0% if LTV ≤ 90%<br>0.25% if LTV > 90%<br>until loan balance reaches 78% of original property value | |
| 10/4/10 to 4/17/11 | 0.85% if LTV≤ 95%<br>0.90% if LTV > 95%<br>until loan balance reaches 78% of original property value | | 0% if LTV≤ 90%<br>0.25% if LTV > 90%<br>until loan balance reaches 78% of original property value | |
| 4/18/11 and later | 1.10% if LTV≤ 95%<br>1.15% if LTV > 95%<br>until loan balance reaches 78% of original property value | | 0.25% if LTV≤ 90%<br>0.50% if LTV > 90%<br>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 later | 1.00% | 1.10% if LTV≤ 95% 1.15% if LTV > 95% until loan balance reaches 78% of original property value | 1.00% | 0.25% if LTV≤ 90% 0.50% if LTV > 90% until loan balance reaches 78% of original property value |

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

**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 include 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 2009 that terminated as claims during the period FY 1999 through FY 2009. The more recent claims after FY 2009 take several quarters to realize their final cash flows and were excluded from the estimation database. 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 10,834 loss mitigation claims in FY 2000 which increased to 124,264 cases in FY 2009. The amount FHA paid in these cases after all adjustments

and curtailments was $33.3 million in FY 2000 which increased to $329.3 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 0.0720, meaning that loss mitigation expenses are typically about 7.20 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 2012 is multiplied by 0.9944 to convert it into a present value in FY 2011. The discount factors used in this Review are larger than the corresponding discount factors in last year's Review since the forecasted level of interest rates has declined.

**Exhibit B-6**

| Year that Cash Flow Occurs | Discount Factor | Year that Cash Flow Occurs | Discount Factor | Year that Cash Flow Occurs | Discount Factor |
|---|---|---|---|---|---|
| 2012 | 0.9944 | 2023 | 0.6565 | 2034 | 0.3750 |
| 2013 | 0.9743 | 2024 | 0.6250 | 2035 | 0.3558 |
| 2014 | 0.9490 | 2025 | 0.5947 | 2036 | 0.3375 |
| 2015 | 0.9227 | 2026 | 0.5657 | 2037 | 0.3201 |
| 2016 | 0.8961 | 2027 | 0.5380 | 2038 | 0.3035 |
| 2017 | 0.8654 | 2028 | 0.5114 | 2039 | 0.2877 |
| 2018 | 0.8303 | 2029 | 0.4860 | 2040 | 0.2727 |
| 2019 | 0.7944 | 2030 | 0.4617 | 2041 | 0.2584 |
| 2020 | 0.7586 | 2031 | 0.4385 | 2042 | 0.2449 |
| 2021 | 0.7234 | 2032 | 0.4163 | 2043 | 0.2320 |
| 2022 | 0.6893 | 2033 | 0.3952 | 2044 | 0.2199 |

## B. Calculating the Economic Value

The economic value of the Fund as of the end of FY 2011 was calculated first by determining the present value of the future cash flows for all surviving loans as of September 30, 2011. This figure was then added to the capital resources of the Fund, estimated as of the same date.

For each fiscal year beyond 2011, 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 (%)** |
| 2012 | 0.56% |
| 2013 | 2.06% |
| 2014 | 2.67% |
| 2015 | 2.85% |
| 2016 | 2.97% |
| 2017 | 3.55% |
| 2018 | 4.23% |

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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 forecasts of the economic factors 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-prepay, default-to-claim, default-to-prepay, default-to-cure by modification, default-to-cure by non-modification assistance, and default-to-cure with no assistance.

For loans that did not terminate and are still in either current or in default status as of FY 2011:Q2, 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, we forecasted the loan performance of future FHA books originated through FY 2018. The dollar endorsement volumes for FY 2011 through FY 2018 are provided by the IFE-created 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 2010:Q3 to FY 2011:Q2. HUD provided detailed compositions by LTV and credit score projected for future books of business. Exhibits C-2 and C-3 present HUD's assumed composition projection of fully-underwritten mortgages of

future books for the base-case scenario. Also, we assume proportions of product types for fully-underwritten mortgages remain stable over FY 2011 to FY2018 as presented in Exhibits 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 |
|---|---|---|---|---|
| FY2011 | $135,983 | $49,040 | $38,763 | $223,786 |
| FY2012 | $123,911 | $23,080 | $6,935 | $153,926 |
| FY2013 | $124,439 | $11,313 | $679 | $136,431 |
| FY2014 | $132,742 | $28,759 | $5,253 | $166,754 |
| FY2015 | $137,907 | $51,238 | $17,285 | $206,430 |
| FY2016 | $130,478 | $50,747 | $17,930 | $199,156 |
| FY2017 | $136,394 | $42,957 | $14,225 | $193,576 |
| FY2018 | $140,718 | $43,219 | $15,311 | $199,248 |

| Period | FHA Purchase Share | FHA Fully Underwritten Refi Share | FHA Streamline Refi Share |
|---|---|---|---|
| FY2011 | 60.8% | 21.9% | 17.3% |
| FY2012 | 80.5% | 15.0% | 4.5% |
| FY2013 | 91.2% | 8.3% | 0.5% |
| FY2014 | 79.6% | 17.2% | 3.2% |
| FY2015 | 66.8% | 24.8% | 8.4% |
| FY2016 | 65.5% | 25.5% | 9.0% |
| FY2017 | 70.5% | 22.2% | 7.3% |
| FY2018 | 70.6% | 21.7% | 7.7% |

**Exhibit C-2**

| | | Projected Composition of FY 2011 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% | 0.23% | 1.60% | 1.14% | 1.96% | 3.42% |
| | 15 Yr | 0.53% | 0.00% | 0.05% | 0.72% | 5.88% | 6.10% | 10.85% | 25.92% |
| 90 < X ≤ 95 | 30 Yr | 0.02% | 0.00% | 0.01% | 0.20% | 1.44% | 1.09% | 2.18% | 4.36% |
| | 15 Yr | 0.07% | 0.00% | 0.08% | 0.10% | 0.62% | 0.62% | 1.50% | 2.89% |
| 95 < X | 30 Yr | 0.20% | 0.00% | 0.06% | 1.71% | 17.84% | 11.10% | 19.52% | 31.83% |
| | 15 Yr | 0.24% | 0.00% | 0.01% | 0.48% | 5.31% | 4.84% | 11.17% | 22.03% |

| | | 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 | 0.07% | 0.00% | 0.05% | 0.25% | 1.71% | 1.07% | 1.89% | 3.36% |
| | 15 Yr | 0.99% | 0.00% | 0.29% | 1.42% | 6.03% | 5.00% | 9.49% | 18.06% |
| 90 < X ≤ 95 | 30 Yr | 0.04% | 0.00% | 0.00% | 0.24% | 1.53% | 1.03% | 2.17% | 4.59% |
| | 15 Yr | 0.11% | 0.00% | 0.00% | 0.19% | 0.95% | 0.86% | 1.82% | 3.18% |
| 95 < X | 30 Yr | 0.32% | 0.00% | 0.00% | 2.07% | 19.33% | 10.44% | 18.79% | 31.07% |
| | 15 Yr | 0.35% | 0.00% | 0.00% | 0.88% | 8.12% | 5.48% | 12.44% | 24.36% |

| | | 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 | 0.08% | 0.00% | 0.15% | 0.57% | 1.79% | 1.02% | 1.69% | 2.63% |
| | 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% | 2.10% | 4.19% |
| | 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% | 18.27% | 29.33% |
| | 15 Yr | 0.36% | 0.00% | 0.00% | 4.25% | 8.72% | 5.75% | 11.51% | 22.04% |

| Loan-to-Value Ratio | Term | Projected Composition of FY 2014 Purchase Loans | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | FICO Score Range | | | | | | | |
| | | Missing | 300-499 | 500-579 | 580-619 | 620-659 | 660-679 | 680-719 | 720-850 |
| X ≤ 90 | 30 Yr | 0.04% | 0.00% | 0.45% | 0.79% | 1.45% | 0.75% | 1.32% | 1.96% |
| | 15 Yr | 0.82% | 0.00% | 2.94% | 2.39% | 6.54% | 3.68% | 7.23% | 12.31% |
| 90 < X ≤ 95 | 30 Yr | 0.03% | 0.00% | 0.00% | 0.78% | 1.51% | 0.87% | 1.67% | 2.87% |
| | 15 Yr | 0.04% | 0.00% | 0.00% | 1.04% | 1.10% | 0.57% | 1.55% | 2.27% |
| 95 < X | 30 Yr | 0.73% | 0.00% | 0.00% | 10.69% | 20.74% | 10.62% | 18.61% | 24.12% |
| | 15 Yr | 0.59% | 0.00% | 0.00% | 8.85% | 9.94% | 6.36% | 12.40% | 19.40% |

| Loan-to-Value Ratio | Term | Projected Composition of FY 2015 - 2018 Purchase Loans | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | FICO Score Range | | | | | | | |
| | | Missing | 300-499 | 500-579 | 580-619 | 620-659 | 660-679 | 680-719 | 720-850 |
| X ≤ 90 | 30 Yr | 0.00% | 0.00% | 0.76% | 1.01% | 1.12% | 0.48% | 0.96% | 1.29% |
| | 15 Yr | 0.17% | 0.00% | 4.94% | 3.13% | 5.58% | 2.71% | 5.87% | 9.28% |
| 90 < X ≤ 95 | 30 Yr | 0.00% | 0.00% | 0.00% | 1.10% | 1.42% | 0.71% | 1.25% | 1.55% |
| | 15 Yr | 0.01% | 0.00% | 0.00% | 1.49% | 1.10% | 0.51% | 1.29% | 1.48% |
| 95 < X | 30 Yr | 1.00% | 0.00% | 0.00% | 16.10% | 22.30% | 11.10% | 18.95% | 18.90% |
| | 15 Yr | 0.83% | 0.00% | 0.00% | 13.45% | 11.15% | 6.97% | 13.28% | 16.76% |

**Exhibit C-3**

| Loan-to-Value Ratio | Term | Projected Composition of FY 2011 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 | 0.08% | 0.00% | 0.33% | 1.03% | 11.25% | 8.12% | 13.15% | 15.24% |
| | 15 Yr | 0.05% | 0.00% | 0.23% | 0.92% | 10.71% | 8.55% | 17.04% | 34.86% |
| 90 < X ≤ 95 | 30 Yr | 0.04% | 0.00% | 0.01% | 0.17% | 3.03% | 2.53% | 5.34% | 9.78% |
| | 15 Yr | 0.01% | 0.00% | 0.01% | 0.07% | 1.29% | 1.32% | 2.76% | 6.37% |
| 95 < X | 30 Yr | 0.06% | 0.00% | 0.02% | 0.22% | 4.35% | 3.67% | 7.45% | 14.12% |
| | 15 Yr | 0.01% | 0.00% | 0.01% | 0.08% | 1.58% | 1.48% | 3.70% | 8.95% |

| | | Projected Composition of FY 2012 Fully Underwritten Refinance 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 | 0.10% | 0.00% | 0.42% | 1.36% | 13.33% | 8.09% | 13.06% | 15.15% |
| | 15 Yr | 0.09% | 0.00% | 0.52% | 1.56% | 13.82% | 9.11% | 18.01% | 32.56% |
| 90 < X ≤ 95 | 30 Yr | 0.04% | 0.00% | 0.00% | 0.25% | 3.49% | 2.43% | 5.16% | 9.07% |
| | 15 Yr | 0.00% | 0.00% | 0.00% | 0.14% | 1.59% | 1.29% | 2.56% | 5.37% |
| 95 < X | 30 Yr | 0.07% | 0.00% | 0.00% | 0.32% | 5.04% | 3.45% | 6.96% | 12.22% |
| | 15 Yr | 0.01% | 0.00% | 0.00% | 0.13% | 1.72% | 1.44% | 3.23% | 6.84% |

| | | Projected Composition of FY 2013 Fully Underwritten Refinance 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 | 0.15% | 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% |

| | | Projected Composition of FY 2014 Fully Underwritten Refinance 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% | 6.50% | 9.96% | 16.46% | 7.67% | 11.61% | 11.29% |
| | 15 Yr | 0.46% | 0.00% | 3.19% | 8.99% | 15.33% | 9.04% | 16.51% | 24.33% |
| 90 < X ≤ 95 | 30 Yr | 0.04% | 0.00% | 0.00% | 2.36% | 4.73% | 2.72% | 4.23% | 5.61% |
| | 15 Yr | 0.09% | 0.00% | 0.00% | 1.58% | 2.32% | 1.52% | 2.98% | 4.49% |
| 95 < X | 30 Yr | 0.04% | 0.00% | 0.00% | 1.65% | 4.16% | 2.30% | 3.76% | 4.85% |
| | 15 Yr | 0.05% | 0.00% | 0.00% | 0.87% | 1.60% | 1.00% | 2.11% | 3.53% |

| Loan-to-Value Ratio | Term | Projected Composition of FY 2015-2018 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 | 0.00% | 0.00% | 11.39% | 15.36% | 17.93% | 7.65% | 12.82% | 12.04% |
| | 15 Yr | 0.78% | 0.00% | 4.94% | 13.94% | 13.77% | 7.86% | 15.77% | 21.24% |
| 90 < X ≤ 95 | 30 Yr | 0.00% | 0.00% | 0.00% | 3.04% | 3.86% | 2.17% | 2.72% | 3.16% |
| | 15 Yr | 0.15% | 0.00% | 0.00% | 2.70% | 2.67% | 1.52% | 3.06% | 4.12% |
| 95 < X | 30 Yr | 0.00% | 0.00% | 0.00% | 1.80% | 2.16% | 1.13% | 1.52% | 1.25% |
| | 15 Yr | 0.08% | 0.00% | 0.00% | 1.42% | 1.40% | 0.80% | 1.61% | 2.16% |

**Exhibit C-4 Product Type Distribution of Fully Underwritten Mortgages for FY 2011-2018**

| Product Type | Proportion |
|---|---|
| Fixed Rate 30 Year Mortgages | 88.01% |
| Fixed Rate 15 Year Mortgages | 8.47% |
| Adjustable Rate Mortgages | 3.52% |

The development of loan-level data for future loans proceeded 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 2010 and the first two quarters of FY 2011. 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 2010-2011 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[1] 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:

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

where parameters "*a*" and "*b*" were estimated by FHFA for each location, $\tau$ is the last time period that the FHFA house price index is available, and *s* is the volatility of the quarterly house price appreciation rate around the regional market forecast. The parameter *s* was estimated by the standard deviation of historical quarterly house price appreciation rates for each location. To avoid the bias of high volatility caused by thin sample sizes, the first sixteen quarters of each local house price index were excluded in the derivation of the parameter *s*.

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 instead if that index is available. In case neither 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 appreciation rates around the MSA or state average appreciation rates computed retrospectively by the HPIs.

[1] 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.

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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 a base-case and five alternative economic scenarios. We began our analysis with the base-case scenario, and the bulk of the report is based on this scenario. The base-case economic scenario is extracted from the July 2011 forecast of the U.S. economy published by Moody's Analytics. The economic components of the Moody's forecasts used in our analysis are:

- FHFA MSA and Census division level housing price indices
- Ten-year constant maturity Treasury rate
- One-year constant maturity Treasury rate
- Commitment rate on 30-year fixed-rate mortgages

A summary of the data used in the base-case scenario is presented in Exhibit D-1. We show the FHFA national house price index in Exhibit D-1 to illustrate the general forecasted trend of the house price growth, rather than displaying each MSA level house price index. The quarterly economic factors forecasted by Moody's are available from FY 2011 through FY 2041.

**Exhibit D-1**

| Economic Forecast[a] (Base-Case Scenario) | | | | |
|---|---|---|---|---|
| **Fiscal Year** | **FHFA National Housing Price Index** | **Commitment Rate on 30-Year Fixed-Rate (%)** | **1-Year Treasury Rate (%)** | **10-Year Treasury Rate (%)** |
| 2011 | 322.6 | 4.70 | 0.26 | 3.18 |
| 2012 | 315.4 | 5.96 | 0.56 | 4.43 |
| 2013 | 319.5 | 7.17 | 1.65 | 5.70 |
| 2014 | 332.3 | 6.75 | 3.18 | 5.12 |
| 2015 | 349.1 | 6.59 | 3.93 | 4.90 |
| 2016 | 362.6 | 6.63 | 3.90 | 5.00 |
| 2017 | 375.1 | 6.68 | 3.87 | 5.07 |
| 2018 | 388.0 | 6.58 | 3.81 | 4.96 |
| 2019 | 402.2 | 6.48 | 3.55 | 4.84 |
| 2020 | 416.9 | 6.37 | 3.41 | 4.72 |
| 2021 | 432.2 | 6.25 | 3.36 | 4.57 |

[a] Source: Moody's Analytics July 2011 Forecast. Numbers are average levels during each fiscal year.

## I. Alternative Scenarios

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

- Stronger Near-Term Rebound (Moody's S1)
- Mild Second Recession (Moody's S2)
- Deeper Second Recession (Moody's S3)
- Protracted Slump (Moody's S4)
- Low Interest Rates (IFE scenario)

The first four alternative scenarios were based on modified versions of the July 2011 alternative economic forecasts published by Moody's Analytics. Moody's projection of alternative future scenarios assumes that the local house price appreciation rate (HPA) will change from that of the base-case 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 base-case scenario. This assumption implies that under pessimistic scenarios, the lower short-term HPA will be followed by a period of stronger HPA. On the other hand, the optimistic scenario assumes that after the stronger short-term growth rates, the house price will suffer a weaker growth rate in the longer run.

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. We modified Moody's alternative HPI scenarios to be consistent with this view. Specifically, the quarterly HPA rates were computed for the base-case and alternative scenarios 1 through 4. Each alternative scenario will follow the original Moody's HPA path, until the quarterly HPA meets that of the base-case scenario. Following the quarter the HPA's cross-over, the HPA of the base-case scenario is applied to generate the remainder of the scenario. The cross-over quarters are FY 2012 Q2, FY 2012 Q4, FY 2013 Q4 and FY 2014 Q1 for scenarios 1 through 4, respectively. This modification ensures that the HPA rate in an optimistic scenario will never fall below that of the base-case scenario, while the HPA rate in a pessimistic scenario will never exceed that of the base-case scenario.

We also constructed a fifth alternative scenario. In Moody's base-case and four alternative economic scenarios, the future paths of interest rates all rise rapidly in the near term. However, 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. Later, on September 21, it announced the plan to invest $400 billion in long-term Treasury securities over the next nine months in an attempt to drive down interest rates on mortgage loans, corporate bonds and other forms of credit. These most recent policies indicate that the interest rates may remain low for an extended time period. These most recent policies indicate that the interest rates may remain low for an extended time period. These announcements came after the analyses of this report had been

completed. Hence, for the fifth alternative scenario we couple the base-case home price scenario with an interest rate path that remains at the current very low level through the end of FY 2013; the rates then gradually rise over two years to the longterm levels of the base-case scenario. Based on the most recent data about the state of the U.S. economy, a near-term persistence of very low rates appears at least as likely as a rise in rates.

## II. Graphical Depiction of the Scenarios

Exhibit D-2 shows the future movements of the national HPI under the base-case and the first four alternative economic scenarios with the above modification in place. This graph shows that the difference among these scenarios depends on the severity and duration of the housing recession. Under the base-case scenario, the HPI does not return to its FY 2007 level until FY 2014, and not until after FY 2018 for all the pessimistic scenarios.

**Exhibit D-2. Path of the Future National House Price Index in Different Scenarios**

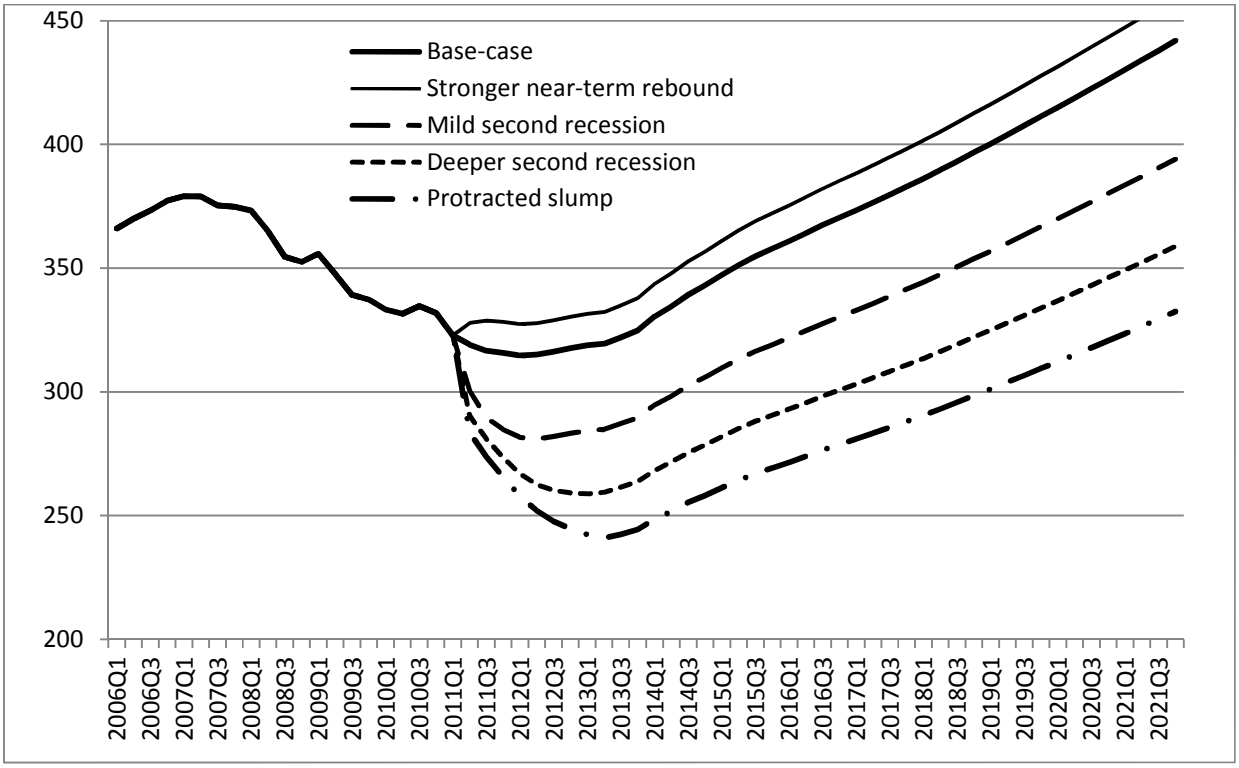
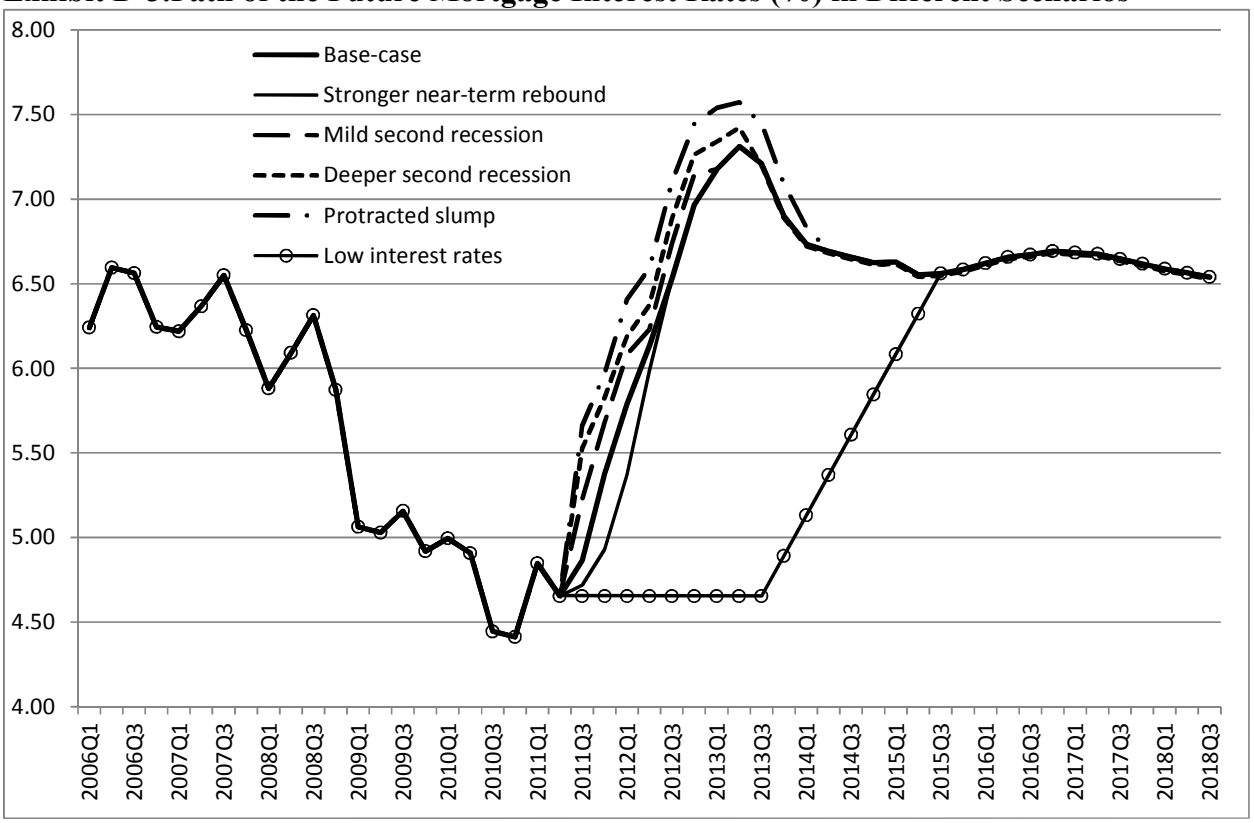



Exhibit D-3 shows the forecasted interest rate of 30-year fixed-rate mortgages in the corresponding scenarios. The mortgage rates across Moody's scenarios rise together and bunch around 7.4 percent within two years and mean-revert to around 6.6 percent in FY 2014. In addition, Moody's model generating the scenarios suggests stagflation where 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 modeled economic outcomes that might impact the Fund.

**Exhibit D-3.Path of the Future Mortgage Interest Rates (%) in Different Scenarios**




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

## Appendix E: Loss Severity Model

This appendix describes the loss severity model used in the FY 2011 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."[1] 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 FY 2010 Review and then again for this year's Review using the most recent data for completed claims. Section I summarizes the model specification and estimation approach, Section II describes the explanatory variables used in this model and Section III presents the estimation results.

### I. Model Specification and Estimation Approach

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

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

Following acquisition, FHA 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 FHA, but not yet sold, FHA incurs various holding costs associated with maintenance, repairs, tax payments and expenses incurred preparing the property for sale. Upon sale of the collateral property, FHA receives the sales price less any sales expenses. In sum, the loss amount is the net amount that FHA incurs from this process:

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

HUD permits pre-foreclosure sales 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, FHA directly pays the loss amount

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

claimed by the lender. 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 presents the overall loss severity rates by termination fiscal year over the 1981-2009 periods. The loss rate has been steadily increasing since FY 2003, due in large measure to the widespread decline in house price growth rates.

**Exhibit E-1**

| Termination Year | Loss Rate |
|---|---|
| 1981 | 55.24% |
| 1982 | 46.08% |
| 1983 | 44.26% |
| 1984 | 48.91% |
| 1985 | 47.61% |
| 1986 | 48.61% |
| 1987 | 51.21% |
| 1988 | 51.10% |
| 1989 | 48.87% |
| 1990 | 47.29% |

| Termination Year | Loss Rate |
|---|---|
| 1991 | 46.62% |
| 1992 | 45.99% |
| 1993 | 44.84% |
| 1994 | 44.96% |
| 1995 | 45.00% |
| 1996 | 44.65% |
| 1997 | 44.36% |
| 1998 | 43.71% |
| 1999 | 42.27% |
| 2000 | 38.51% |

| Termination Year | Loss Rate |
|---|---|
| 2001 | 33.83% |
| 2002 | 31.84% |
| 2003 | 32.10% |
| 2004 | 35.96% |
| 2005 | 37.95% |
| 2006 | 41.75% |
| 2007 | 49.36% |
| 2008 | 59.39% |
| 2009 | 63.67% |

Exhibit E-2 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 over the FY 2003 through FY 2006 time period. In these cases, the remaining foreclosure procedures or house sales were avoided by HUD.

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. The modeling assumes that the distribution between future conveyance and pre-foreclosure sales will remain stable and consistent with that observed over the last few years.

**Exhibit E-2.Percentages of Different Claim Terminations by Fiscal Year**

| Termination Year | Conveyance | Asset Sales | Coinsurance | Without Conveyance | Pre-Foreclosure |
|---|---|---|---|---|---|
| 1999 | 95.12 | 0.11 | 0.02 | 0.00 | 4.75 |
| 2000 | 95.17 | 0.10 | 0.01 | 0.00 | 4.72 |
| 2001 | 95.04 | 0.01 | 0.00 | 0.00 | 4.96 |
| 2002 | 94.36 | 0.00 | 0.00 | 0.00 | 5.64 |
| 2003 | 86.89 | 8.35 | 0.00 | 0.00 | 4.76 |
| 2004 | 86.28 | 8.12 | 0.00 | 0.00 | 5.59 |
| 2005 | 84.66 | 9.00 | 0.00 | 0.00 | 6.33 |
| 2006 | 90.20 | 2.66 | 0.00 | 0.00 | 7.14 |
| 2007 | 93.15 | 0.00 | 0.00 | 0.00 | 6.84 |
| 2008 | 93.20 | 0.00 | 0.00 | 0.06 | 6.74 |
| 2009 | 90.11 | 0.00 | 0.00 | 0.04 | 9.84 |
| 2010 | 86.19 | 0.32 | 0.00 | 0.00 | 13.49 |

## A. Specification of the Loss Severity Model

As described above, there are several components of the loss amount, and each component can be influenced by several factors. For example, foregone interest depends on the interest rate of 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 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 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.

We estimated the loss rate as a function of all these explanatory factors. In contrast to the claim and prepayment rate modeling, 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 loss rate model. The specification of the regression model is:

$$Loss\ Rate_i = f(X_i) + \varepsilon_i$$

where $Loss\ Rate_i$ is the realized loss rate of claim $i$, $X_i$ includes all explanatory factors for claim $i$, and $\varepsilon_i$ is the error term.

**B. Estimation Sample**

The sample used to estimate the loss severity model for the FY 2011 Review consists of claimed loans under the categories conveyance and pre-foreclosure sales based on loan-level data from the FHA single-family data warehouse. The available data cover the period from the first quarter of FY 1975 to the fourth quarter of FY 2010. To focus on the policy environment most relevant for the future Fund performance, our analysis used the sample with termination years from FY 1999 through FY 2009. The claim data during this period are more complete and reliable, with completed claim data for which all the elements of costs have been recorded. Many claims associated with loans terminated in FY 2010 or later have not yet been fully resolved, so the loss rates for these claims will be biased by the faster property dispositions. Thus, loans with claims after FY 2009 are excluded from the estimation sample. 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 estimation includes 642,244 loans claimed over these past 11 years. Exhibit E-3 quantifies the impact of the various sample exclusions.

**Exhibit E-3.Regression Sample Filters used in Developing Loss Severity Model**

| | Loan Count |
|---|---|
| **Original Total Observations** | 1,805,295 |
| Drop terminations earlier than FY 1991 | 430,440 |
| Drop cases with termination in FY 2011 (too recent) | 49,187 |
| Drop cases with UPB = 0 | 77 |
| Drop cases with missing LTV data | 86,443 |
| Drop cases with other miscellaneous data quality issues | 2,986 |
| **Observations Surviving First Round of Exclusions** | 1,236,162 |
| Drop cases with no disposition year and also claim type not pre-foreclosure | 113,670 |
| Drop terminations earlier than FY 1999 | 399,921 |
| Drop cases with termination year ≥ FY 2010 because of incomplete claim data | 78,322 |
| Apply random sampling to reduce pre-foreclosure proportion to 7% for terminations in FY 2009 | 2,005 |
| **Observations Used to Estimate the Loss Severity Regression Model** | 642,244 |

## II. Explanatory Variables

As with the loan status transition models described in Appendix A, there are four main categories of explanatory variables applied in the loss severity analysis:

- Fixed initial loan characteristics, including mortgage product type, origination year, original loan amount;
- Fixed initial borrower characteristics, including borrower credit scores and indicators of the source of downpayment assistance where relevant;
- Dynamic variables based entirely on loan information, including mortgage age, scheduled amortization of the loan balance relative loan size, current loan-to-value; and
- Dynamic variables derived by combining loan information with economic time series such as house price appreciation rates and interest rates.

Exhibit E-4 summarizes the explanatory variables that were used in the loss severity model. All variables are 0-1 dummy variables, 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, - origination year, termination year, yield curve slope, and loan size. Only the indicator of 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 three variables were constructed.

- **Deficiency Judgment State**: Some states allow lenders to sue borrowers for the lender's losses after foreclosure. We used the website http://www.foreclosurefish.com/blog/index.php?id=994 to identify such "deficiency judgment" states. The possibility of recourse is expected to lower losses, all else equal. This is a new variable introduced compared to last year's model.

- **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 local house price indexes. Since CLTV has significant explanatory power for estimating the loss rate, original LTV was dropped from loss severity model for the FY 2011 Review

- **House Price Appreciation Rate:**The house price appreciation rate is the appreciation rate by state during the foreclosure period, between default and disposition. This variable is strongly related to the sale price when FHA disposes of the property. In a declining/improving housing market, the FHA 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 FHA (from claim to disposition) is also 4 quarters. Thus, the appreciation is measured over 8 quarters, centered on the claim date.

## Exhibit E-4.Explanatory Variables in the Loss Rate Model

| Variable Name | Value | Description |
|---|---|---|
| **Refinance** | | |
| refinance_cat_1 | Not Refinance Loan | Indicates whether the purpose of the loan was for refinancing |
| refinance_cat_2 | Refinance Loan | |
| | | |
| **Judicial** | | |
| judicial_cat_1 | Not Judicial | Indicates whether property is located in a state utilizing a judicial foreclosure process. |
| judicial_cat_2 | Judicial | |
| | | |
| **Deficiency Judgment State** | | |
| Deficiency judgment | One if deficiency judgment | Indicates whether property is located in a state that allows deficiency judgment. |
| | | |
| **Downpayment Source** | | |
| Nonprofit | One if non-profit gift | Indicates whether downpayment assistance was provided by a non-profit. |
| | | |
| **Unicon** | | |
| Unicon | One if loan is 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** | | |
| age1 | $X \leq 3$ | Quarterly age of the loans. |
| age2 | $3 < X \leq 7$ | |
| age3 | $7 < X \leq 11$ | |
| age4 | $11 < X \leq 15$ | |
| age5 | $15 < X \leq 19$ | |
| age6 | $19 < X \leq 23$ | |
| age7 | $23 < X \leq 27$ | |
| age8 | $27 < X \leq 31$ | |
| age9 | $31 < X \leq 35$ | |
| age10 | $35 < X \leq 39$ | |
| age11 | $39 < X$ | |
| | | |

| Variable Name | Value | Description |
|---|---|---|
| **Loan Type** | | |
| loan_type_1 | 30-year FRM | Loan product type. |
| loan_type_2 | 15-year FRM | |
| loan_type_3 | ARM | |
| loan_type_4 | 30-year SR FRM | |
| loan_type_5 | 15-year SR FRM | |
| loan_type_6 | SR ARM | |
| | | |
| **Credit Score** | | |
| fico_000 | Missing | Borrower FICO scores range. |
| fico_300_499 | $300 \leq X \leq 499$ | |
| fico_500_579 | $500 \leq X \leq 579$ | |
| fico_580_619 | $580 \leq X \leq 619$ | |
| fico_620_659 | $620 \leq X \leq 659$ | |
| fico_660_679 | $660 \leq X \leq 679$ | |
| fico_680_719 | $680 \leq X \leq 719$ | |
| fico_720_850 | $720 \leq X \leq 850$ | |
| fico_999 | Not Collected | |
| | | |
| **CLTV** | | |
| cltv_1 | $X < 60$ | Current loan-to-value (%) at the claim date. House price is updated by state-level house price indices. |
| cltv_2 | $60 \leq X < 70$ | |
| cltv_3 | $70 \leq X < 80$ | |
| cltv_4 | $80 \leq X < 90$ | |
| cltv_5 | $90 \leq X < 100$ | |
| cltv_6 | $X \geq 100$ | |
| | | |
| **HPA** | | |
| hpa4_1 | $X < -0.12$ | Average annual house price appreciation rate during the eight quarters surrounding the claim date. |
| hpa4_2 | $-0.12 \leq X < -0.08$ | |
| hpa4_3 | $-0.08 \leq X < -0.04$ | |
| hpa4_4 | $-0.04 \leq X < 0$ | |
| hpa4_5 | $0 \leq X < 0.04$ | |
| hpa4_6 | $0.04 \leq X < 0.08$ | |
| hpa4_7 | $0.08 \leq X < 0.12$ | |

| Variable Name | Value | Description |
|---|---|---|
| hpa4_8 | 0.12 ≤ X < 0.16 | |
| hpa4_9 | 0.16 ≤ X | |
| | | |
| **Original Amortization Year (3 partitions)** | | |
| fy_1975_1986_cat_1 | X ≥ 1986 | Pre-FY 1986 Q3 origination prior to changes in FHA underwriting requirements. Prior to availability of credit score data. |
| fy_1975_1986_cat_2 | X < 1986 | |
| fy_1986_1992_cat_1 | 1986 > X or 1992 ≤ X | Post-FY 1986 Q3 and pre-FY 1992 origination. After changes in FHA underwriting requirements. Prior to availability of sample credit score data. |
| fy_1986_1992_cat_2 | 1986 ≤ X < 1992 | |
| fy_1996_XXXX_cat_1 | X ≤ 1996 | Post-FY1996 origination. After changes in FHA underwriting requirements. For SR loan products with no credit score data. |
| fy_1996_XXXX_cat_2 | X > 1996 | |
| | | |
| **Termination Year** | | |
| term_fy_2001_XXXX_cat_1 | X ≤ 2001 | Dummy variables based on termination year, with matured FHA loss mitigation program after FY 2001. |
| term_fy_2001_XXXX_cat_2 | X > 2001 | |
| | | |
| **Yield Curve Slope** | | |
| ycslopecat_cat_1 | 0 ≤ X ≤ 1 | Yield curve slope measured as ratio of 10-year CMT to 1-year CMT rates. |
| ycslopecat_cat_2 | 1 < X ≤ 1.2 | |
| ycslopecat_cat_3 | 1.2 < X ≤ 1.5 | |
| ycslopecat_cat_4 | X > 1.5 | |
| | | |
| **Relative Loan Size** | | |
| loancat_cat_1 | 0 < X ≤ 60 | 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). |
| loancat_cat_2 | 60 < X ≤ 90 | |
| loancat_cat_3 | 90 < X ≤ 110 | |
| loancat_cat_4 | 110 < X ≤ 140 | |
| loancat_cat_5 | X > 140 | |

## III. Estimation Results

Exhibit E-5 presents the regression coefficients and their standard errors and t-statistics.

**Exhibit E-5**

| Variable | Coefficient | Standard Error | t - statistic |
|---|---|---|---|
| refinance_cat_2 | 0.0740 | 0. 019 | .13 |
| Unicon | 0.0571 | 0.0019 | 30.29 |
| judicial_cat_2 | 0.1012 | 0.0009 | 111.98 |
| deficiency judgment | -0.0555 | 0.0015 | -37.48 |
| Nonprofit | 0.0371 | 0.0014 | 27.30 |
| ycslopecat_cat_2 | 0.0013 | 0.0013 | 0.98 |
| ycslopecat_cat_3 | -0.0188 | 0.0017 | -10.98 |
| ycslopecat_cat_4 | -0.0553 | 0.0013 | -42.46 |
| fy_1975_1985_cat_2 | 0.4508 | 0.0056 | 79.92 |
| fy_1986_1991_cat_2 | 0.1048 | 0.0035 | 30.13 |
| fy_1996_XXXX_cat_2 | 0.0070 | 0.0015 | 4.56 |
| term_fy_2001_XXXX_cat_2 | 0.0393 | 0.0015 | 26.17 |
| age2 | 0.0591 | 0.0056 | 10.61 |
| age3 | 0.0937 | 0.0056 | 16.67 |
| age4 | 0.1292 | 0.0057 | 22.76 |
| age5 | 0.1627 | 0.0058 | 28.22 |
| age6 | 0.1947 | 0.0059 | 33.21 |
| age7 | 0.2377 | 0.0060 | 39.77 |
| age8 | 0.2798 | 0.0061 | 45.69 |
| age9 | 0.3192 | 0.0063 | 50.53 |
| age10 | 0.3494 | 0.0066 | 53.31 |
| age11 | 0.4561 | 0.0066 | 68.93 |
| loan_type_2 | 0.1939 | 0.0049 | 39.35 |
| loan_type_3 | 0.0189 | 0.0013 | 14.03 |
| loan_type_4 | -0.0693 | 0.0029 | -23.62 |
| loan_type_5 | 0.1010 | 0.0124 | 8.13 |
| loan_type_6 | -0.0501 | 0.0052 | -9.70 |
| fico_000 | 0.0615 | 0.0021 | 29.93 |
| fico_300_499 | 0.0755 | 0.0037 | 20.18 |
| fico_500_579 | 0.0434 | 0.0018 | 24.06 |
| fico_580_619 | 0.0171 | 0.0018 | 9.43 |
| fico_660_679 | -0.0075 | 0.0028 | -2.63 |

| Variable | Coefficient | Standard Error | t - statistic |
|---|---|---|---|
| fico_680_719 | -0.0183 | 0.0029 | -6.41 |
| fico_720_850 | -0.0222 | 0.0040 | -5.62 |
| fico_999 | 0.0784 | 0.0023 | 34.49 |
| cltv_2 | 0.0892 | 0.0018 | 49.80 |
| cltv_3 | 0.1941 | 0.0019 | 99.97 |
| cltv_4 | 0.2697 | 0.0022 | 122.63 |
| cltv_5 | 0.2980 | 0.0029 | 103.58 |
| cltv_6 | 0.2833 | 0.0040 | 71.31 |
| loancat_cat_2 | -0.1842 | 0.0012 | -147.74 |
| loancat_cat_3 | -0.2903 | 0.0014 | -212.46 |
| loancat_cat_4 | -0.3485 | 0.0014 | -250.85 |
| loancat_cat_5 | -0.3799 | 0.0018 | -217.06 |
| hpa4_2 | -0.0507 | 0.0035 | -14.54 |
| hpa4_3 | -0.1622 | 0.0034 | -47.80 |
| hpa4_4 | -0.1903 | 0.0032 | -59.67 |
| hpa4_5 | -0.3178 | 0.0032 | -100.40 |
| hpa4_6 | -0.3988 | 0.0030 | -131.36 |
| hpa4_7 | -0.4432 | 0.0030 | -145.60 |
| hpa4_8 | -0.4498 | 0.0032 | -140.95 |
| hpa4_9 | -0.4583 | 0.0031 | -147.54 |
| intercept | 0.5955 | 0.0074 | 79.93 |
| F( 52,642224) = 5251.50<br>Prob > F =0.000<br>R-squared= 0.2984 | | | |

Based on quarterly UPB-weighted averages of loan-level terminations, Exhibit E-6 and Exhibit E-7 show the in-sample fits by loss rate percentage and loss amount in dollars.

**Exhibit E-6**

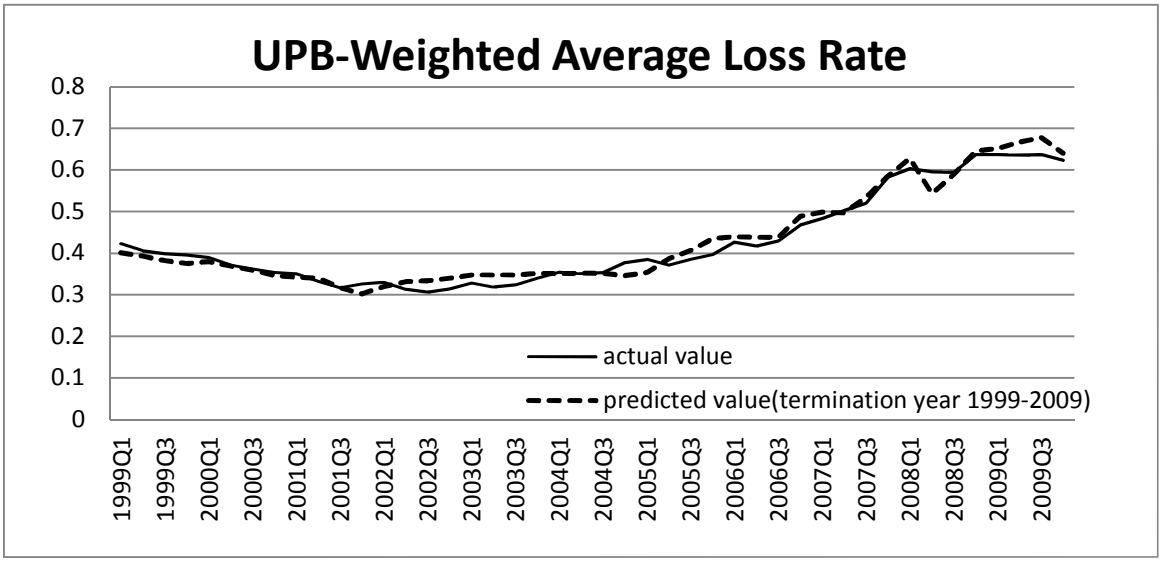
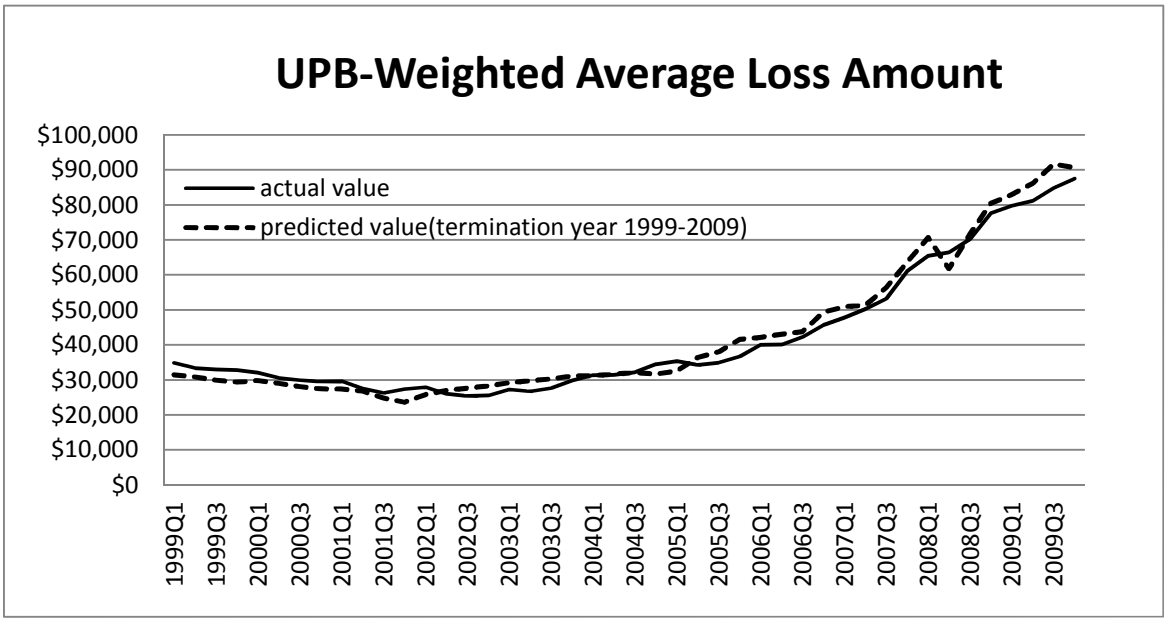



**Exhibit E-7**




The in-sample model errors are quite small across time despite using only one regime change variable for loans terminated after 2001.

## Appendix F: FHA Volume Model

Previous Actuarial Reviews have relied on HUD's own estimates of the future FHA mortgage volumes. In this year's review, we developed 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 dollar volume of FHA streamlined refinances; and last, we estimate the share of FHA fully-underwritten refinance volume as a specified share of the national refinance volume.

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 streamline refinance volume is a function of the national market refinance share and lagged FHA streamline refinance volume. 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.

Instead of using a model equation, the FHA purchase volume is derived from the national purchase volume based on an assumed share. The forecasted share starts out at the observed 2011:Q1 purchase share of 30 percent (historically way above average) and is reduced in steps the further out the projection. The FHA share of the purchase market ends up in FY 2018 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 the historical average within the next couple of 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 observed data over historical calendar quarters 1990:Q1 through 2011:Q1.

The following items define our notation:

Variables:
V = National Volume ($ millions)
F = FHA Volume ($ millions)
R = Interest Rate
H = National Home Price Index
Q = Quarter Indicator (= 1 for first calendar quarter, = 2 for second quarter, etc.)
T = 1 after calendar year 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

$\alpha, \beta, \theta, \lambda, \gamma, \varphi$ 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:

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

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

$$LnF_t^S = \alpha_0 + \sum_{k=1}^{2} \beta_k LnF_{t-k}^S + \sum_{k=0}^{1} \theta_k Ln\left(V_{t-k}^R /(V_{t-k}^P + V_{t-k}^R)\right) \quad (3)$$

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

When estimating the volume model, we used historical data from public sources as well as the FHA data warehouse as of June 2011. Exhibit F-1 details the data sources.

**Exhibit F-1. Sources and Description of Variables**

| Variables | Source | Description |
|---|---|---|
| 1 year treasury rate | economy.com | Interest Rates: 1-Yr Constant Maturity Securities |
| 10 year treasury rate | economy.com | Interest Rates: 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[1] | National Mortgage Origination, Purchase and Refinance, 1-4 Family, June 2011 |
| FHA originations | FHA data warehouse | FHA loans separated into three different types |

Exhibits F-2 through F-5 provide the details of the regression results for Equations 1 - 4 above. Exhibits F-6 through F-9 are charts of the in-sample fits. 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 | 0.5108 | 4.39 | <.0001 |
| Ln(National Purchase Volume), lagged 2 qtr | 0.0898 | 0.70 | 0.4856 |
| Ln(National Purchase Volume), lagged 3 qtr | 0.2783 | 2.50 | 0.0148 |
| Ln (Home Price at t / Home Price t-4 ) | 1.6236 | 3.89 | 0.0002 |
| Jan, Feb, Mar | -0.1435 | -2.49 | 0.0152 |
| Apr, May, June | 0.2530 | 3.53 | 0.0007 |
| July, Aug, Sept | 0.1409 | 2.19 | 0.0314 |
| Intercept | 1.3549 | 2.97 | 0.0040 |
| Number of observations = 82<br>R-Squared = 92.6<br>Durbin-Watson Statistic = 1.986 | | | |

[1] Mortgage Bankers Association, http://www.mbaa.org/default.htm

**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 | 0.7974 | 13.73 | <.0001 |
| Mortgage rate at t | -0.5932 | -8.06 | <.0001 |
| Mortgage rate, lagged 1 quarter | -0.2237 | -1.93 | 0.0571 |
| Mortgage rate, lagged 2 quarters | 0.8315 | 7.05 | <.0001 |
| Mortgage rate, lagged 3 quarters | -0.3010 | -2.70 | 0.0086 |
| Mortgage rate, lagged 4 quarters | 0.1617 | 2.17 | 0.0332 |
| Spread between 10 Yr and 1 Yr | -0.0283 | -1.05 | 0.2988 |
| Ln (Home Price at t / Home Price t-4 ) | 2.6369 | 3.41 | 0.0011 |
| Intercept | 3.1740 | 3.38 | 0.0011 |
| Number of observations = 84<br>R-Squared = 95.5<br>Durbin-Watson Statistic = 2.46 | | | |

**Exhibit F-4. Ln(FHA Streamline Refinance Dollar Volume) Regression: Equation (3)**

| Variable Name | Coefficient | t-statistic | Pr > \| t \| |
|---|---|---|---|
| Ln(FHA Streamline Refi Volume), lagged 1 qtr | 1.1157 | 3.49 | 0.0008 |
| Ln(FHA Streamline Refi Volume), lagged 2 qtr | -0.3017 | 12.14 | <.0001 |
| Ln(Market Refi Vol/(Market Refi+Market Purchase Vol)) | 1.6707 | -4.31 | <.0001 |
| Ln(Market Refi Vol/(Market Refi+Market Purchase Vol)) 1 qtr lag | -1.2172 | 10.77 | <.0001 |
| Intercept | 1.8858 | -5.86 | <.0001 |
| Number of observations = 84<br>R-Squared = 91.0<br>Durbin-Watson Statistic = 2.07 | | | |

**Exhibit F-5. Ln(FHA Fully Underwritten Refinance (FUWR) Volume / National Market Refinance Volume) Regression: Equation (4)**

| Variable Name | Coefficient | t-statistic | Pr > \| t \| |
|---|---|---|---|
| Ln(FHA FUWR Volume/Market Refi Vol), lagged 1 qtr | 0.9010 | 22.04 | <.0001 |
| Mortgage rate at t | 0.5025 | 4.15 | <.0001 |
| Mortgage rate, lagged 1 quarter | -0.4080 | -2.27 | 0.0259 |
| Mortgage rate, lagged 2 quarters | -0.3151 | -1.75 | 0.0837 |
| Mortgage rate, lagged 3 quarters | 0.3134 | 1.77 | 0.0811 |
| Mortgage rate, lagged 4 quarters | -0.0586 | -0.51 | 0.6148 |
| Dummy = 1 if >= CY 2007 | 0.3468 | 2.71 | 0.0082 |
| Intercept | -0.7051 | -2.57 | 0.0123 |
| Number of observations = 84<br>R-Squared = 94.8<br>Durbin-Watson Statistic = 1.82 | | | |

**Exhibit F-6. National Purchase Volume In-Sample Fit ($ millions)**

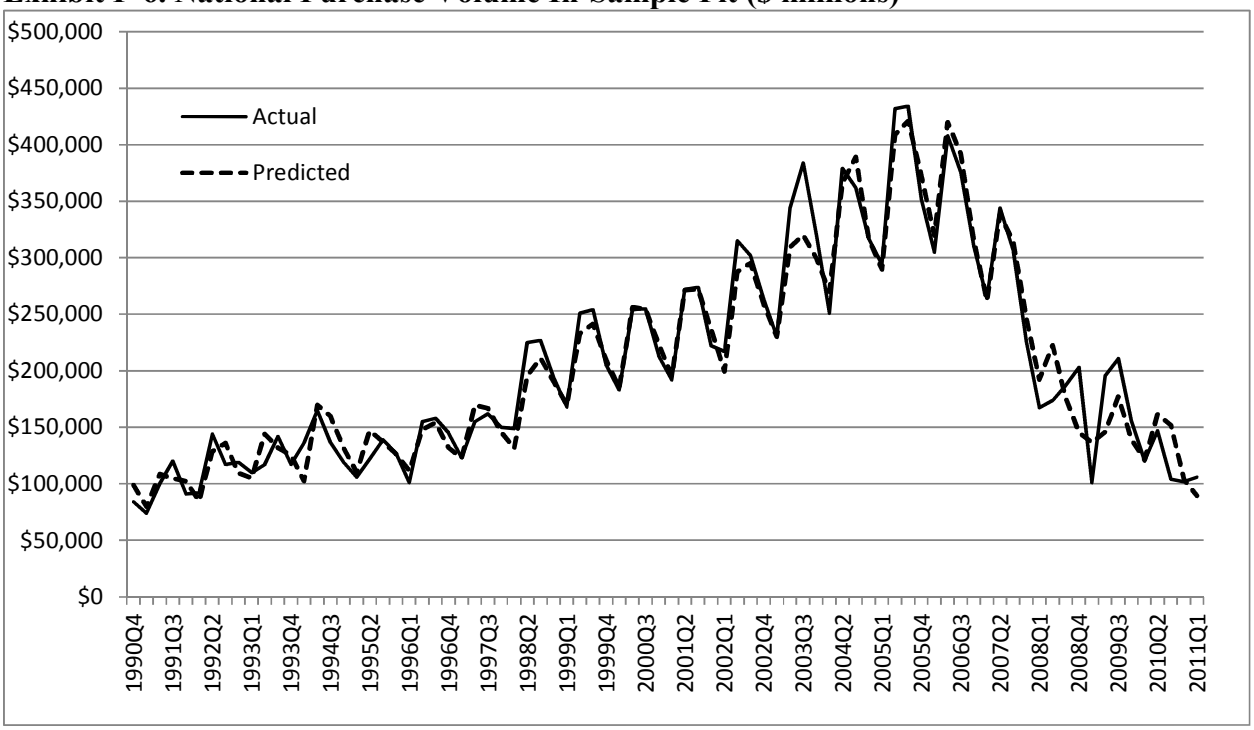


**Exhibit F-7. National Refinance Volume In-Sample Fit ($ millions)**

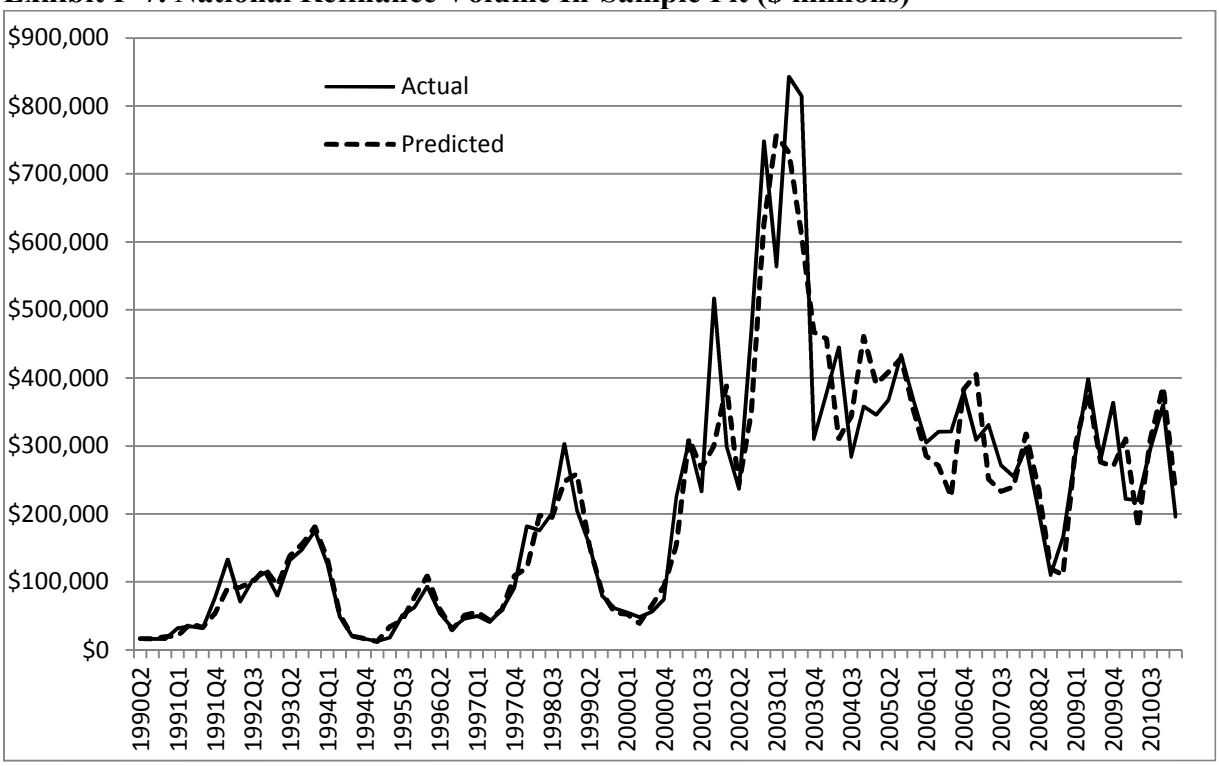


**Exhibit F-8. FHA Streamlined Refinance Volume In-Sample Fit ($ millions)**

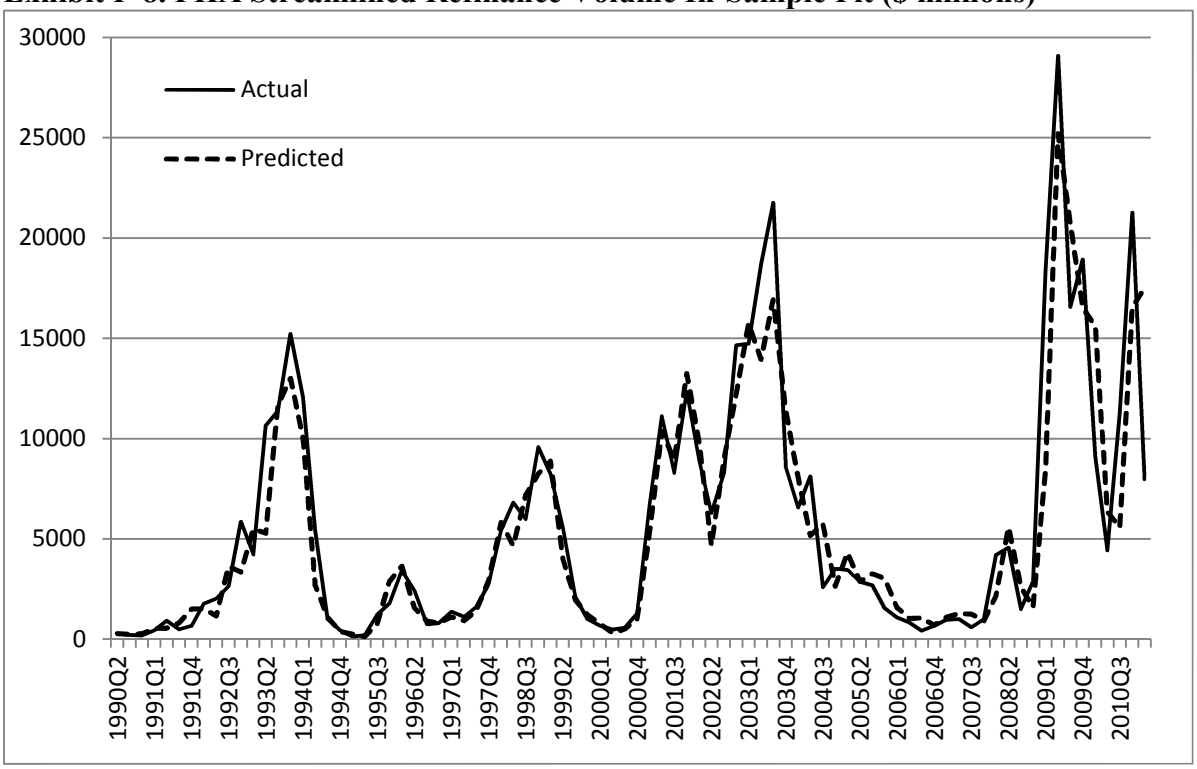
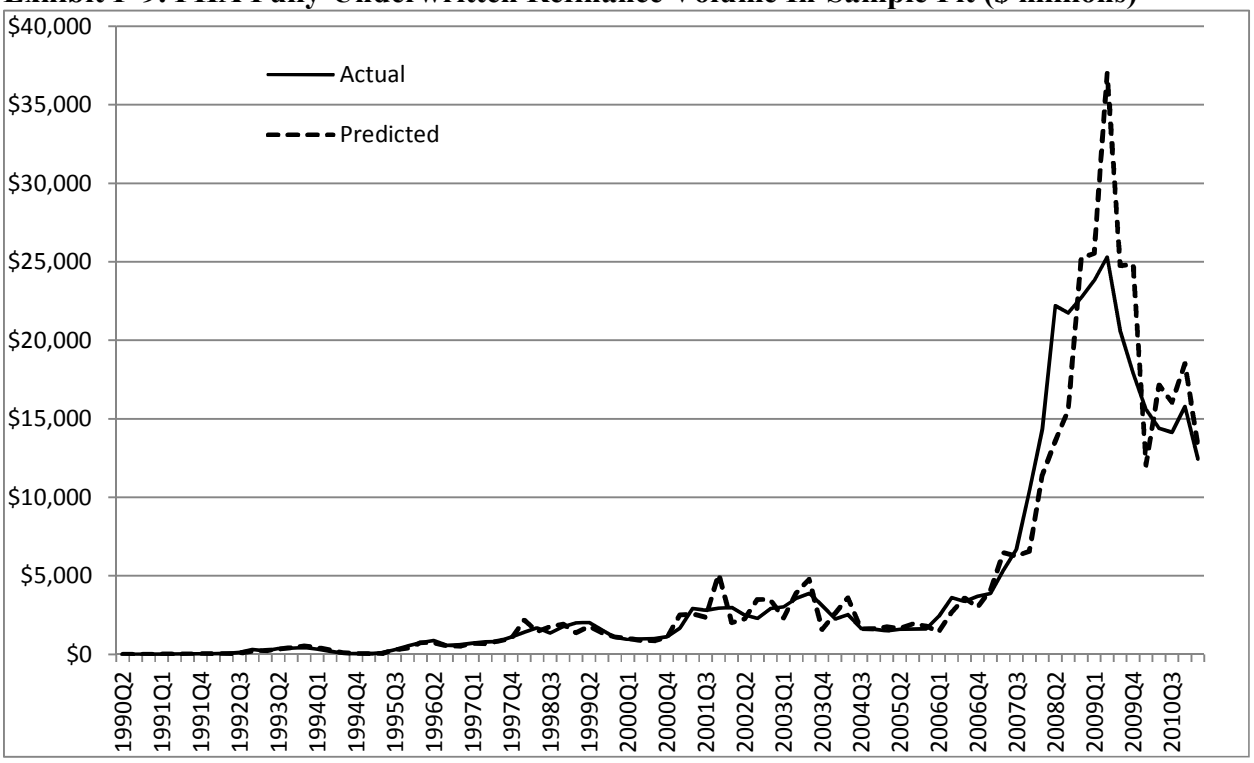


**Exhibit F-9. FHA Fully-Underwritten Refinance Volume In-Sample Fit ($ millions)**




Model implementation to derive the dollar forecasts requires a few additional steps. In the fully-underwritten refinance 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 2011: 0.3468 (no adjustment)
Calendar Year 2012-2013: 0.2774 (80% of the original coefficient)
Calendar Year 2014-2018: 0.2081 (60% of the original coefficient)

This assumption reflects a return to relative market normalcy but with a continued elevated level of FHA refinance market share.

With this assumption, the forecasted value of the fully-underwritten refinance dollar volume follows from equations (2) and (4):

$$F_t^R = \exp(Ln\frac{F_t^R}{V_t^R}) * \exp(LnV_t^R) \qquad (5)$$

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:

$$F_t^P = \exp(LnV_t^P) * \textit{ Assumed Share in Fiscal Year} \quad (6)$$

According to FHA's projection, the FHA purchase shares are assumed to follow the pattern shown in Exhibit F-10.

**Exhibit F-10. Assumed FHA Purchase Volume Share**

| Fiscal Years | FHA Purchase Volume Share of National Purchase Volume |
|---|---|
| 2011-2012 | 30% |
| 2013 | 28% |
| 2014 | 26% |
| 2015 | 23% |
| 2016-2018 | 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.

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1982 | 0.10 | 1.82 | 4.01 | 5.27 | 6.31 | 8.35 | 8.60 | 5.42 | 3.23 | 2.23 | 1.93 | 1.44 | 1.24 | 1.01 | 0.69 | 0.61 | 0.57 | 0.30 | 0.19 | 0.13 | 0.16 | 0.15 | 0.08 | 0.08 | 0.02 | 0.01 | 0.00 | 0.01 | 0.01 | **0.02** |
| 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 | 0.46 | 0.39 | 0.21 | 0.23 | 0.17 | 0.10 | 0.08 | 0.05 | 0.05 | 0.03 | 0.04 | **0.03** | **0.05** |
| 1984 | 0.03 | 0.96 | 2.78 | 4.93 | 7.29 | 6.28 | 4.35 | 3.27 | 2.87 | 2.55 | 2.52 | 2.17 | 1.67 | 1.57 | 1.19 | 1.02 | 0.80 | 0.54 | 0.36 | 0.27 | 0.18 | 0.14 | 0.12 | 0.09 | 0.06 | 0.08 | 0.07 | **0.06** | **0.08** | **0.07** |
| 1985 | 0.02 | 0.83 | 3.24 | 6.00 | 5.37 | 4.02 | 3.38 | 3.06 | 3.06 | 2.97 | 2.82 | 2.00 | 1.93 | 1.64 | 1.15 | 1.21 | 0.72 | 0.54 | 0.37 | 0.31 | 0.21 | 0.15 | 0.11 | 0.16 | 0.15 | 0.10 | **0.07** | **0.11** | **0.11** | **0.11** |
| 1986 | 0.01 | 0.45 | 1.73 | 2.18 | 2.03 | 1.85 | 1.67 | 1.58 | 1.79 | 1.86 | 1.53 | 1.47 | 1.27 | 1.10 | 0.98 | 0.64 | 0.49 | 0.43 | 0.42 | 0.28 | 0.19 | 0.20 | 0.14 | 0.16 | 0.19 | **0.18** | **0.16** | **0.17** | **0.19** | **0.11** |
| 1987 | 0.01 | 0.35 | 1.02 | 1.23 | 1.26 | 1.27 | 1.23 | 1.40 | 1.44 | 1.23 | 1.25 | 1.10 | 1.00 | 0.85 | 0.51 | 0.43 | 0.43 | 0.41 | 0.30 | 0.20 | 0.17 | 0.15 | 0.24 | 0.23 | **0.21** | **0.20** | **0.22** | **0.23** | **0.14** | **0.11** |
| 1988 | 0.01 | 0.36 | 1.05 | 1.47 | 1.75 | 1.84 | 2.31 | 2.54 | 2.11 | 2.05 | 1.84 | 1.69 | 1.43 | 0.88 | 0.74 | 0.68 | 0.66 | 0.47 | 0.39 | 0.24 | 0.29 | 0.32 | 0.32 | **0.29** | **0.25** | **0.27** | **0.30** | **0.19** | **0.15** | **0.12** |
| 1989 | 0.01 | 0.30 | 1.05 | 1.60 | 1.97 | 2.70 | 3.00 | 2.49 | 2.39 | 1.98 | 1.76 | 1.55 | 0.96 | 0.83 | 0.75 | 0.73 | 0.57 | 0.48 | 0.36 | 0.32 | 0.37 | 0.46 | **0.32** | **0.29** | **0.31** | **0.35** | **0.22** | **0.19** | **0.16** | **0.12** |
| 1990 | 0.01 | 0.28 | 1.06 | 1.74 | 2.57 | 2.87 | 2.35 | 2.40 | 2.06 | 1.82 | 1.55 | 1.00 | 0.79 | 0.76 | 0.71 | 0.54 | 0.48 | 0.46 | 0.45 | 0.39 | 0.60 | **0.39** | **0.48** | **0.37** | **0.42** | **0.27** | **0.23** | **0.20** | **0.16** | **0.12** |
| 1991 | 0.01 | 0.30 | 1.16 | 2.04 | 2.61 | 2.31 | 2.48 | 2.18 | 1.87 | 1.66 | 1.03 | 0.86 | 0.76 | 0.75 | 0.61 | 0.46 | 0.40 | 0.45 | 0.44 | 0.46 | **0.40** | **0.60** | **0.41** | **0.47** | **0.31** | **0.27** | **0.24** | **0.20** | **0.16** | **0.12** |
| 1992 | 0.00 | 0.20 | 0.77 | 1.26 | 1.40 | 1.77 | 1.71 | 1.58 | 1.36 | 0.90 | 0.70 | 0.63 | 0.57 | 0.49 | 0.41 | 0.31 | 0.37 | 0.38 | 0.37 | **0.38** | **0.63** | **0.48** | **0.51** | **0.34** | **0.31** | **0.28** | **0.24** | **0.21** | **0.18** | **0.15** |
| 1993 | 0.00 | 0.16 | 0.61 | 0.99 | 1.48 | 1.45 | 1.31 | 1.09 | 0.66 | 0.52 | 0.49 | 0.50 | 0.40 | 0.32 | 0.27 | 0.28 | 0.32 | 0.45 | **0.34** | **0.60** | **0.43** | **0.41** | **0.27** | **0.24** | **0.20** | **0.18** | **0.16** | **0.14** | **0.12** | **0.10** |
| 1994 | 0.00 | 0.21 | 0.73 | 1.32 | 1.60 | 1.50 | 1.16 | 0.73 | 0.60 | 0.55 | 0.54 | 0.45 | 0.36 | 0.30 | 0.27 | 0.36 | 0.53 | **0.38** | **0.62** | **0.43** | **0.43** | **0.28** | **0.25** | **0.21** | **0.19** | **0.17** | **0.14** | **0.13** | **0.11** | **0.09** |
| 1995 | 0.01 | 0.29 | 1.36 | 2.29 | 2.73 | 2.41 | 1.71 | 1.39 | 1.62 | 1.50 | 1.17 | 0.96 | 0.78 | 0.81 | 0.89 | 1.18 | **0.76** | **1.12** | **0.77** | **0.81** | **0.54** | **0.49** | **0.44** | **0.39** | **0.34** | **0.30** | **0.27** | **0.24** | **0.20** | **0.16** |
| 1996 | 0.00 | 0.30 | 1.35 | 2.29 | 2.32 | 1.68 | 1.45 | 1.63 | 1.62 | 1.30 | 1.05 | 0.86 | 0.89 | 0.94 | 1.20 | **0.82** | **1.41** | **1.00** | **0.97** | **0.61** | **0.53** | **0.45** | **0.39** | **0.34** | **0.29** | **0.26** | **0.23** | **0.19** | **0.16** | **0.13** |
| 1997 | 0.01 | 0.39 | 1.60 | 2.38 | 1.99 | 2.01 | 2.27 | 2.15 | 1.80 | 1.42 | 1.23 | 1.26 | 1.25 | 1.47 | **0.94** | **1.65** | **1.18** | **1.17** | **0.75** | **0.66** | **0.57** | **0.49** | **0.43** | **0.37** | **0.32** | **0.29** | **0.25** | **0.20** | **0.17** | **0.13** |
| 1998 | 0.01 | 0.34 | 1.16 | 1.29 | 1.36 | 1.66 | 1.84 | 1.66 | 1.41 | 1.15 | 1.16 | 1.24 | 1.52 | **1.11** | **1.90** | **1.24** | **1.14** | **0.69** | **0.59** | **0.49** | **0.43** | **0.37** | **0.33** | **0.29** | **0.26** | **0.22** | **0.19** | **0.15** | **0.13** | **0.10** |
| 1999 | 0.01 | 0.32 | 0.88 | 1.30 | 1.89 | 2.19 | 2.00 | 1.59 | 1.31 | 1.29 | 1.38 | 1.70 | **1.26** | **2.16** | **1.34** | **1.21** | **0.73** | **0.60** | **0.50** | **0.44** | **0.38** | **0.33** | **0.30** | **0.26** | **0.23** | **0.19** | **0.16** | **0.13** | **0.11** | **0.09** |
| 2000 | 0.01 | 0.49 | 1.99 | 4.05 | 4.80 | 4.07 | 3.32 | 2.84 | 2.89 | 2.76 | 3.17 | **2.05** | **3.19** | **2.38** | **2.33** | **1.43** | **1.26** | **1.10** | **0.94** | **0.82** | **0.72** | **0.63** | **0.57** | **0.49** | **0.42** | **0.35** | **0.30** | **0.25** | **0.22** | **0.22** |
| 2001 | 0.01 | 0.43 | 1.83 | 3.62 | 3.77 | 3.26 | 2.76 | 2.69 | 2.59 | 3.14 | **2.25** | **3.71** | **2.49** | **2.16** | **1.23** | **1.01** | **0.84** | **0.72** | **0.63** | **0.56** | **0.49** | **0.44** | **0.39** | **0.33** | **0.28** | **0.23** | **0.20** | **0.18** | **0.19** | **0.14** |
| 2002 | 0.01 | 0.47 | 2.08 | 2.83 | 2.69 | 2.42 | 2.42 | 2.45 | 2.98 | **2.26** | **3.88** | **2.47** | **2.08** | **1.18** | **0.92** | **0.75** | **0.65** | **0.57** | **0.50** | **0.45** | **0.40** | **0.34** | **0.29** | **0.25** | **0.21** | **0.18** | **0.17** | **0.18** | **0.15** | **0.11** |
| 2003 | 0.01 | 0.67 | 1.59 | 1.81 | 1.74 | 1.85 | 2.00 | 2.61 | **2.03** | **3.61** | **2.22** | **1.93** | **1.06** | **0.77** | **0.62** | **0.52** | **0.45** | **0.39** | **0.35** | **0.30** | **0.26** | **0.22** | **0.19** | **0.16** | **0.13** | **0.13** | **0.14** | **0.11** | **0.09** | **0.07** |
| 2004 | 0.12 | 0.89 | 1.47 | 1.74 | 2.13 | 2.29 | 2.83 | **2.39** | **4.19** | **2.67** | **2.39** | **1.32** | **0.95** | **0.75** | **0.63** | **0.54** | **0.46** | **0.41** | **0.35** | **0.30** | **0.26** | **0.22** | **0.19** | **0.16** | **0.15** | **0.16** | **0.14** | **0.11** | **0.09** | **0.07** |
| 2005 | 0.11 | 0.76 | 1.82 | 2.66 | 3.23 | 3.91 | **3.00** | **4.94** | **3.06** | **2.80** | **1.53** | **1.07** | **0.78** | **0.62** | **0.50** | **0.42** | **0.35** | **0.30** | **0.25** | **0.21** | **0.18** | **0.15** | **0.12** | **0.11** | **0.12** | **0.10** | **0.08** | **0.07** | **0.05** | **0.04** |
| 2006 | 0.02 | 0.61 | 2.21 | 3.71 | 5.18 | **3.76** | **6.43** | **4.09** | **3.82** | **2.12** | **1.52** | **1.11** | **0.83** | **0.65** | **0.52** | **0.43** | **0.36** | **0.30** | **0.25** | **0.20** | **0.17** | **0.14** | **0.13** | **0.14** | **0.12** | **0.10** | **0.08** | **0.07** | **0.06** | **0.04** |
| 2007 | 0.02 | 0.81 | 3.18 | 5.64 | **4.61** | **8.88** | **5.73** | **5.51** | **3.15** | **2.29** | **1.69** | **1.28** | **0.97** | **0.77** | **0.62** | **0.51** | **0.41** | **0.34** | **0.28** | **0.23** | **0.19** | **0.18** | **0.19** | **0.16** | **0.14** | **0.11** | **0.09** | **0.08** | **0.06** | **0.05** |
| 2008 | 0.01 | 0.68 | 3.31 | **3.96** | **8.30** | **5.61** | **5.44** | **3.16** | **2.30** | **1.68** | **1.25** | **0.94** | **0.73** | **0.60** | **0.48** | **0.39** | **0.31** | **0.26** | **0.21** | **0.18** | **0.17** | **0.18** | **0.15** | **0.13** | **0.11** | **0.09** | **0.07** | **0.06** | **0.05** | **0.04** |
| 2009 | 0.01 | 0.48 | **1.27** | **3.35** | **3.00** | **3.08** | **1.87** | **1.33** | **0.95** | **0.69** | **0.52** | **0.40** | **0.31** | **0.25** | **0.20** | **0.17** | **0.14** | **0.12** | **0.10** | **0.10** | **0.10** | **0.09** | **0.07** | **0.06** | **0.05** | **0.04** | **0.03** | **0.03** | **0.02** | **0.02** |
| 2010 | 0.01 | **0.24** | **1.31** | **1.68** | **1.99** | **1.24** | **0.92** | **0.70** | **0.54** | **0.42** | **0.33** | **0.26** | **0.22** | **0.18** | **0.15** | **0.13** | **0.11** | **0.09** | **0.09** | **0.10** | **0.08** | **0.07** | **0.06** | **0.05** | **0.04** | **0.03** | **0.03** | **0.02** | **0.02** | **0.01** |
| 2011 | **0.02** | **0.43** | **1.02** | **1.50** | **1.09** | **0.84** | **0.66** | **0.53** | **0.43** | **0.35** | **0.29** | **0.25** | **0.21** | **0.18** | **0.15** | **0.13** | **0.11** | **0.11** | **0.11** | **0.10** | **0.08** | **0.07** | **0.06** | **0.05** | **0.04** | **0.03** | **0.03** | **0.02** | **0.02** | **0.01** |
| 2012 | **0.02** | **0.31** | **0.98** | **1.01** | **1.01** | **0.91** | **0.80** | **0.70** | **0.62** | **0.54** | **0.47** | **0.41** | **0.35** | **0.31** | **0.26** | **0.23** | **0.22** | **0.23** | **0.19** | **0.16** | **0.14** | **0.11** | **0.09** | **0.08** | **0.07** | **0.06** | **0.05** | **0.04** | **0.03** | **0.02** |
| 2013 | **0.01** | **0.35** | **0.85** | **1.24** | **1.37** | **1.29** | **1.21** | **1.12** | **1.03** | **0.93** | **0.83** | **0.73** | **0.64** | **0.57** | **0.50** | **0.50** | **0.52** | **0.46** | **0.39** | **0.33** | **0.28** | **0.24** | **0.20** | **0.17** | **0.14** | **0.11** | **0.10** | **0.08** | **0.06** | **0.05** |
| 2014 | **0.01** | **0.28** | **0.85** | **1.21** | **1.32** | **1.25** | **1.17** | **1.08** | **0.98** | **0.86** | **0.74** | **0.64** | **0.56** | **0.48** | **0.48** | **0.51** | **0.44** | **0.38** | **0.32** | **0.27** | **0.23** | **0.19** | **0.16** | **0.13** | **0.11** | **0.09** | **0.07** | **0.06** | **0.05** | **0.04** |
| 2015 | **0.01** | **0.30** | **0.90** | **1.29** | **1.42** | **1.37** | **1.29** | **1.19** | **1.05** | **0.91** | **0.77** | **0.66** | **0.56** | **0.56** | **0.59** | **0.52** | **0.45** | **0.38** | **0.32** | **0.27** | **0.22** | **0.19** | **0.16** | **0.13** | **0.11** | **0.09** | **0.07** | **0.06** | **0.05** | **0.04** |
| 2016 | **0.01** | **0.31** | **0.93** | **1.36** | **1.53** | **1.49** | **1.40** | **1.27** | **1.12** | **0.94** | **0.79** | **0.68** | **0.67** | **0.69** | **0.61** | **0.53** | **0.46** | **0.39** | **0.33** | **0.27** | **0.23** | **0.19** | **0.16** | **0.14** | **0.11** | **0.09** | **0.07** | **0.06** | **0.05** | **0.04** |
| 2017 | **0.01** | **0.33** | **1.00** | **1.47** | **1.66** | **1.59** | **1.48** | **1.33** | **1.14** | **0.95** | **0.79** | **0.78** | **0.80** | **0.71** | **0.62** | **0.54** | **0.46** | **0.39** | **0.33** | **0.28** | **0.23** | **0.20** | **0.16** | **0.13** | **0.11** | **0.09** | **0.07** | **0.06** | **0.05** | **0.04** |
| 2018 | **0.01** | **0.33** | **1.01** | **1.49** | **1.68** | **1.60** | **1.47** | **1.30** | **1.09** | **0.91** | **0.87** | **0.88** | **0.78** | **0.68** | **0.59** | **0.50** | **0.43** | **0.36** | **0.31** | **0.26** | **0.22** | **0.18** | **0.15** | **0.12** | **0.10** | **0.08** | **0.07** | **0.06** | **0.05** | **0.04** |

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1982 | 0.41 | 19.77 | 10.34 | 14.50 | 33.67 | 31.38 | 15.06 | 10.78 | 8.74 | 7.89 | 9.43 | 9.71 | 9.81 | 4.47 | 4.86 | 4.38 | 5.38 | 7.71 | 2.87 | 2.53 | 2.49 | 1.94 | 1.95 | 1.19 | 1.29 | 0.97 | 0.46 | 0.37 | 0.55 | **0.97** |
| 1983 | 0.35 | 0.84 | 2.12 | 18.72 | 29.24 | 12.37 | 9.51 | 11.34 | 13.71 | 22.34 | 22.62 | 23.08 | 9.39 | 10.67 | 9.23 | 10.94 | 13.35 | 6.34 | 5.50 | 6.35 | 5.94 | 5.18 | 3.72 | 2.70 | 2.09 | 1.73 | 1.21 | 1.26 | **1.32** | **2.00** |
| 1984 | 0.26 | 1.49 | 21.00 | 29.00 | 13.50 | 10.93 | 11.93 | 12.63 | 19.25 | 20.51 | 21.90 | 9.13 | 10.24 | 8.91 | 10.46 | 11.44 | 6.18 | 5.50 | 6.04 | 6.02 | 5.07 | 3.77 | 6.27 | 2.15 | 2.28 | 3.62 | 1.59 | **1.53** | **2.43** | **1.89** |
| 1985 | 0.34 | 12.10 | 25.58 | 11.84 | 9.65 | 11.95 | 14.26 | 24.52 | 25.83 | 25.21 | 9.49 | 11.19 | 9.74 | 12.10 | 12.85 | 7.87 | 6.74 | 7.77 | 7.69 | 6.39 | 4.69 | 9.04 | 2.72 | 2.95 | 6.01 | 2.13 | **1.64** | **2.89** | **2.47** | **1.60** |
| 1986 | 0.58 | 4.10 | 2.98 | 3.53 | 4.96 | 6.08 | 15.70 | 28.34 | 27.25 | 8.09 | 12.34 | 10.45 | 17.12 | 19.04 | 10.28 | 12.63 | 16.93 | 18.96 | 14.98 | 10.73 | 13.70 | 6.19 | 4.80 | 6.12 | 3.54 | **2.53** | **3.28** | **3.00** | **2.07** | **1.44** |
| 1987 | 0.25 | 0.98 | 1.86 | 3.10 | 3.69 | 9.27 | 21.02 | 22.38 | 6.96 | 10.78 | 9.29 | 16.15 | 19.36 | 10.30 | 13.46 | 19.35 | 24.29 | 18.61 | 13.77 | 15.58 | 7.67 | 6.30 | 6.61 | 5.06 | **3.35** | **3.66** | **2.85** | **2.31** | **1.82** | **1.37** |
| 1988 | 0.30 | 1.34 | 3.20 | 4.93 | 15.67 | 29.43 | 28.02 | 8.29 | 12.65 | 10.49 | 16.45 | 19.03 | 10.79 | 12.66 | 17.18 | 19.45 | 16.33 | 11.98 | 15.26 | 6.81 | 5.08 | 4.78 | 3.52 | **2.86** | **3.97** | **3.50** | **2.55** | **1.96** | **1.64** | **1.29** |
| 1989 | 0.31 | 1.85 | 4.36 | 16.69 | 31.88 | 30.02 | 8.49 | 12.88 | 10.50 | 17.02 | 19.52 | 10.93 | 13.20 | 18.35 | 20.52 | 17.90 | 13.32 | 16.24 | 7.04 | 5.09 | 4.68 | 3.41 | **3.07** | **4.50** | **3.77** | **2.90** | **2.28** | **1.95** | **1.65** | **1.31** |
| 1990 | 0.32 | 1.91 | 10.52 | 33.26 | 32.14 | 8.51 | 13.23 | 10.51 | 17.64 | 20.43 | 10.96 | 13.93 | 20.12 | 22.92 | 19.43 | 14.46 | 19.64 | 8.22 | 6.05 | 5.79 | 4.05 | **3.32** | **5.02** | **4.21** | **3.23** | **2.61** | **2.24** | **1.93** | **1.66** | **1.29** |
| 1991 | 0.34 | 5.56 | 28.35 | 31.58 | 7.85 | 13.19 | 10.65 | 18.64 | 21.30 | 10.96 | 15.38 | 21.86 | 25.97 | 21.54 | 15.87 | 19.37 | 9.16 | 6.44 | 6.41 | 4.08 | **3.48** | **5.53** | **4.50** | **3.59** | **3.06** | **2.63** | **2.30** | **2.04** | **1.72** | **1.37** |
| 1992 | 0.52 | 8.62 | 16.98 | 6.51 | 11.54 | 10.05 | 19.02 | 22.49 | 11.30 | 17.43 | 24.93 | 32.50 | 25.50 | 18.94 | 15.91 | 11.90 | 8.56 | 6.37 | 5.43 | **4.16** | **6.22** | **4.26** | **3.93** | **3.80** | **3.28** | **2.90** | **2.61** | **2.28** | **1.96** | **1.59** |
| 1993 | 1.26 | 6.28 | 4.64 | 8.49 | 8.10 | 14.56 | 18.69 | 10.69 | 16.87 | 25.61 | 39.34 | 29.16 | 21.79 | 17.28 | 12.64 | 9.78 | 7.76 | 6.75 | **4.84** | **7.00** | **4.03** | **3.54** | **3.66** | **3.02** | **2.56** | **2.54** | **2.24** | **1.96** | **1.75** | **1.36** |
| 1994 | 0.81 | 2.83 | 7.16 | 7.48 | 13.45 | 16.09 | 9.90 | 15.79 | 22.45 | 36.63 | 28.04 | 21.67 | 16.92 | 12.75 | 9.80 | 7.73 | 6.46 | **5.10** | **7.11** | **4.07** | **3.38** | **3.46** | **2.90** | **2.47** | **2.41** | **2.14** | **1.91** | **1.71** | **1.45** | **1.13** |
| 1995 | 1.91 | 9.84 | 9.89 | 21.65 | 20.86 | 10.50 | 18.24 | 24.95 | 33.43 | 28.12 | 23.13 | 18.55 | 13.98 | 9.00 | 5.98 | 5.10 | **4.26** | **7.56** | **4.83** | **4.45** | **4.35** | **3.71** | **3.26** | **3.06** | **2.76** | **2.50** | **2.30** | **2.00** | **1.71** | **1.35** |
| 1996 | 0.60 | 4.21 | 18.73 | 20.82 | 9.99 | 18.23 | 25.33 | 36.28 | 29.63 | 24.36 | 18.95 | 14.13 | 9.63 | 6.74 | 5.45 | **4.78** | **7.76** | **4.47** | **4.14** | **4.11** | **3.42** | **2.94** | **2.82** | **2.53** | **2.29** | **2.11** | **1.84** | **1.59** | **1.35** | **1.06** |
| 1997 | 0.95 | 14.76 | 24.41 | 11.23 | 21.84 | 25.87 | 34.89 | 28.86 | 24.02 | 19.06 | 14.26 | 9.76 | 6.25 | 4.80 | **4.60** | **8.43** | **5.19** | **4.85** | **4.82** | **4.09** | **3.57** | **3.32** | **3.00** | **2.71** | **2.51** | **2.20** | **1.93** | **1.68** | **1.43** | **1.13** |
| 1998 | 1.89 | 10.19 | 7.57 | 16.26 | 24.20 | 40.57 | 32.33 | 26.30 | 19.63 | 14.46 | 9.95 | 7.84 | 5.98 | **5.72** | **8.74** | **4.37** | **3.90** | **3.85** | **3.15** | **2.67** | **2.66** | **2.44** | **2.29** | **2.09** | **1.83** | **1.61** | **1.41** | **1.22** | **1.03** | **0.80** |
| 1999 | 0.85 | 3.40 | 13.25 | 22.70 | 39.55 | 31.82 | 26.59 | 19.48 | 14.15 | 9.86 | 8.10 | 6.25 | **6.31** | **8.74** | **4.54** | **3.81** | **3.46** | **2.88** | **2.46** | **2.39** | **2.17** | **2.06** | **1.90** | **1.68** | **1.48** | **1.30** | **1.14** | **0.99** | **0.83** | **0.68** |
| 2000 | 0.96 | 29.18 | 35.42 | 37.99 | 30.19 | 26.19 | 20.11 | 15.37 | 9.69 | 6.50 | 4.65 | **4.75** | **9.44** | **6.21** | **5.94** | **5.54** | **4.72** | **4.15** | **3.81** | **3.46** | **3.16** | **2.90** | **2.55** | **2.26** | **2.00** | **1.76** | **1.54** | **1.33** | **1.15** | **0.95** |
| 2001 | 5.61 | 22.08 | 46.12 | 34.19 | 27.75 | 20.09 | 14.02 | 9.74 | 8.61 | 5.89 | **5.87** | **9.28** | **5.02** | **4.87** | **4.67** | **3.90** | **3.34** | **3.27** | **3.03** | **2.90** | **2.65** | **2.33** | **2.06** | **1.82** | **1.60** | **1.40** | **1.22** | **1.12** | **1.03** | **0.81** |
| 2002 | 4.12 | 36.96 | 31.77 | 27.08 | 19.67 | 14.81 | 10.13 | 9.32 | 6.74 | **6.62** | **8.60** | **5.08** | **4.55** | **4.36** | **3.79** | **3.19** | **3.01** | **2.74** | **2.66** | **2.45** | **2.18** | **1.92** | **1.70** | **1.50** | **1.31** | **1.15** | **1.06** | **0.98** | **0.83** | **0.65** |
| 2003 | 9.53 | 21.16 | 24.87 | 17.87 | 12.98 | 8.72 | 8.88 | 7.12 | **7.84** | **7.21** | **5.22** | **3.78** | **3.22** | **2.98** | **2.61** | **2.22** | **1.96** | **1.84** | **1.70** | **1.52** | **1.34** | **1.18** | **1.04** | **0.91** | **0.79** | **0.74** | **0.70** | **0.60** | **0.50** | **0.38** |
| 2004 | 7.09 | 20.76 | 16.79 | 12.50 | 7.75 | 7.29 | 5.97 | **6.66** | **6.57** | **5.19** | **3.69** | **3.33** | **3.15** | **2.84** | **2.48** | **2.13** | **1.93** | **1.76** | **1.56** | **1.37** | **1.21** | **1.07** | **0.94** | **0.82** | **0.77** | **0.72** | **0.63** | **0.54** | **0.45** | **0.33** |
| 2005 | 7.05 | 11.65 | 10.90 | 7.55 | 7.23 | 5.66 | **4.77** | **3.55** | **2.85** | **2.22** | **2.13** | **2.08** | **1.97** | **1.81** | **1.62** | **1.46** | **1.33** | **1.18** | **1.05** | **0.93** | **0.82** | **0.72** | **0.63** | **0.59** | **0.55** | **0.48** | **0.42** | **0.37** | **0.31** | **0.23** |
| 2006 | 1.40 | 7.71 | 9.11 | 12.31 | 7.56 | **5.14** | **2.83** | **2.08** | **1.67** | **1.56** | **1.57** | **1.55** | **1.57** | **1.51** | **1.50** | **1.43** | **1.30** | **1.17** | **1.05** | **0.93** | **0.82** | **0.72** | **0.69** | **0.66** | **0.59** | **0.52** | **0.46** | **0.40** | **0.34** | **0.26** |
| 2007 | 1.43 | 11.35 | 15.87 | 8.12 | **4.81** | **2.60** | **1.83** | **1.49** | **1.40** | **1.44** | **1.42** | **1.50** | **1.52** | **1.57** | **1.60** | **1.48** | **1.34** | **1.20** | **1.08** | **0.95** | **0.84** | **0.81** | **0.77** | **0.69** | **0.61** | **0.54** | **0.47** | **0.41** | **0.33** | **0.26** |
| 2008 | 2.11 | 22.47 | 12.62 | **6.86** | **2.99** | **2.23** | **1.70** | **1.58** | **1.63** | **1.64** | **1.67** | **1.68** | **1.73** | **1.75** | **1.65** | **1.50** | **1.35** | **1.22** | **1.07** | **0.94** | **0.91** | **0.88** | **0.78** | **0.69** | **0.61** | **0.54** | **0.48** | **0.39** | **0.33** | **0.26** |
| 2009 | 6.13 | 9.04 | **7.02** | **4.14** | **3.31** | **2.39** | **2.28** | **2.37** | **2.43** | **2.44** | **2.36** | **2.26** | **2.15** | **1.98** | **1.79** | **1.58** | **1.39** | **1.24** | **1.10** | **1.06** | **1.03** | **0.91** | **0.81** | **0.71** | **0.63** | **0.56** | **0.48** | **0.42** | **0.36** | **0.28** |
| 2010 | 1.80 | **4.81** | **5.02** | **4.40** | **3.21** | **3.10** | **3.19** | **3.18** | **3.07** | **2.89** | **2.70** | **2.52** | **2.30** | **2.09** | **1.85** | **1.60** | **1.41** | **1.25** | **1.22** | **1.17** | **1.04** | **0.93** | **0.83** | **0.73** | **0.65** | **0.57** | **0.50** | **0.44** | **0.37** | **0.29** |
| 2011 | **1.52** | **6.15** | **5.60** | **4.64** | **4.12** | **4.11** | **3.97** | **3.78** | **3.58** | **3.43** | **3.22** | **3.03** | **2.74** | **2.46** | **2.16** | **1.83** | **1.60** | **1.55** | **1.48** | **1.30** | **1.15** | **1.02** | **0.90** | **0.80** | **0.71** | **0.63** | **0.55** | **0.47** | **0.39** | **0.31** |
| 2012 | **3.71** | **7.73** | **9.86** | **9.78** | **8.57** | **7.69** | **7.29** | **6.89** | **6.55** | **6.21** | **5.55** | **5.01** | **4.53** | **4.04** | **3.49** | **2.93** | **2.79** | **2.68** | **2.35** | **2.07** | **1.82** | **1.58** | **1.40** | **1.24** | **1.10** | **0.97** | **0.84** | **0.72** | **0.62** | **0.48** |
| 2013 | **3.31** | **12.36** | **14.00** | **13.35** | **11.41** | **11.15** | **10.85** | **10.76** | **10.31** | **9.47** | **8.57** | **7.89** | **7.30** | **6.63** | **5.77** | **5.37** | **5.09** | **4.52** | **4.04** | **3.59** | **3.19** | **2.82** | **2.49** | **2.19** | **1.88** | **1.67** | **1.42** | **1.21** | **1.02** | **0.79** |
| 2014 | **2.78** | **9.90** | **10.87** | **10.33** | **9.47** | **9.25** | **9.29** | **9.21** | **8.85** | **8.08** | **7.41** | **6.71** | **5.96** | **5.24** | **5.00** | **4.56** | **3.99** | **3.55** | **3.15** | **2.77** | **2.36** | **2.09** | **1.85** | **1.63** | **1.43** | **1.22** | **1.07** | **0.90** | **0.76** | **0.61** |
| 2015 | **2.79** | **9.28** | **9.90** | **10.01** | **9.11** | **8.89** | **8.91** | **8.56** | **7.82** | **7.13** | **6.47** | **5.81** | **5.24** | **5.14** | **4.84** | **4.08** | **3.57** | **3.16** | **2.77** | **2.42** | **2.07** | **1.83** | **1.61** | **1.43** | **1.23** | **1.06** | **0.92** | **0.79** | **0.67** | **0.54** |
| 2016 | **2.86** | **9.16** | **10.25** | **10.30** | **9.61** | **9.60** | **9.09** | **8.39** | **7.78** | **7.25** | **6.57** | **5.96** | **5.94** | **5.67** | **4.92** | **4.10** | **3.52** | **3.08** | **2.69** | **2.38** | **2.11** | **1.87** | **1.64** | **1.40** | **1.21** | **1.05** | **0.89** | **0.78** | **0.67** | **0.53** |
| 2017 | **2.69** | **9.09** | **10.25** | **10.56** | **9.96** | **9.46** | **8.91** | **8.13** | **7.52** | **7.07** | **6.47** | **6.45** | **6.34** | **5.68** | **4.96** | **4.19** | **3.53** | **3.13** | **2.77** | **2.45** | **2.13** | **1.85** | **1.62** | **1.41** | **1.21** | **1.05** | **0.92** | **0.80** | **0.69** | **0.55** |
| 2018 | **2.68** | **9.01** | **10.17** | **10.52** | **9.47** | **8.76** | **8.30** | **7.53** | **7.11** | **6.68** | **6.65** | **6.58** | **6.00** | **5.34** | **4.72** | **3.99** | **3.35** | **2.96** | **2.60** | **2.28** | **1.99** | **1.71** | **1.51** | **1.31** | **1.15** | **1.02** | **0.90** | **0.79** | **0.68** | **0.54** |

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1982 | 0.10 | 1.91 | 5.04 | 8.57 | 11.95 | 14.63 | 16.29 | 17.09 | 17.49 | 17.74 | 17.92 | 18.05 | 18.15 | 18.22 | 18.26 | 18.30 | 18.33 | 18.35 | 18.36 | 18.36 | 18.37 | 18.38 | 18.38 | 18.38 | 18.39 | 18.39 | 18.39 | 18.39 | 18.39 | **18.39** |
| 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 | 17.68 | 17.68 | 17.69 | 17.69 | 17.69 | 17.70 | 17.70 | 17.70 | **17.70** | **17.70** | **17.71** |
| 1985 | 0.02 | 0.85 | 3.66 | 7.36 | 10.07 | 11.78 | 12.99 | 13.89 | 14.54 | 14.98 | 15.28 | 15.47 | 15.62 | 15.73 | 15.80 | 15.86 | 15.89 | 15.91 | 15.92 | 15.93 | 15.94 | 15.95 | 15.95 | 15.95 | 15.96 | 15.96 | **15.96** | **15.96** | **15.97** | **15.97** |
| 1986 | 0.01 | 0.46 | 2.10 | 4.07 | 5.80 | 7.25 | 8.46 | 9.40 | 10.14 | 10.68 | 11.08 | 11.41 | 11.65 | 11.83 | 11.95 | 12.02 | 12.06 | 12.10 | 12.12 | 12.14 | 12.14 | 12.15 | 12.16 | 12.16 | 12.17 | **12.18** | **12.18** | **12.19** | **12.19** | **12.20** |
| 1987 | 0.01 | 0.36 | 1.36 | 2.54 | 3.68 | 4.79 | 5.73 | 6.57 | 7.22 | 7.73 | 8.18 | 8.54 | 8.80 | 8.98 | 9.07 | 9.14 | 9.20 | 9.23 | 9.26 | 9.27 | 9.28 | 9.29 | 9.30 | 9.31 | **9.32** | **9.32** | **9.33** | **9.34** | **9.35** | **9.35** |
| 1988 | 0.01 | 0.37 | 1.40 | 2.78 | 4.32 | 5.66 | 6.81 | 7.68 | 8.33 | 8.86 | 9.28 | 9.59 | 9.80 | 9.91 | 9.99 | 10.05 | 10.09 | 10.12 | 10.14 | 10.15 | 10.16 | 10.17 | 10.18 | **10.19** | **10.20** | **10.21** | **10.22** | **10.22** | **10.23** | **10.23** |
| 1989 | 0.01 | 0.32 | 1.34 | 2.82 | 4.31 | 5.65 | 6.65 | 7.39 | 7.98 | 8.41 | 8.72 | 8.94 | 9.05 | 9.13 | 9.20 | 9.24 | 9.27 | 9.29 | 9.30 | 9.32 | 9.33 | 9.34 | **9.35** | **9.36** | **9.37** | **9.38** | **9.38** | **9.39** | **9.39** | **9.40** |
| 1990 | 0.01 | 0.29 | 1.33 | 2.83 | 4.27 | 5.31 | 6.07 | 6.73 | 7.21 | 7.56 | 7.79 | 7.91 | 8.00 | 8.06 | 8.11 | 8.14 | 8.16 | 8.17 | 8.19 | 8.20 | 8.21 | **8.22** | **8.24** | **8.24** | **8.25** | **8.26** | **8.27** | **8.27** | **8.27** | **8.28** |
| 1991 | 0.01 | 0.31 | 1.40 | 2.75 | 3.89 | 4.80 | 5.61 | 6.24 | 6.66 | 6.95 | 7.10 | 7.21 | 7.28 | 7.34 | 7.37 | 7.39 | 7.40 | 7.42 | 7.43 | 7.44 | **7.45** | **7.47** | **7.48** | **7.49** | **7.50** | **7.50** | **7.51** | **7.51** | **7.51** | **7.52** |
| 1992 | 0.00 | 0.20 | 0.91 | 1.85 | 2.81 | 3.87 | 4.77 | 5.42 | 5.85 | 6.09 | 6.25 | 6.35 | 6.41 | 6.45 | 6.48 | 6.49 | 6.51 | 6.52 | 6.54 | **6.55** | **6.57** | **6.59** | **6.61** | **6.62** | **6.62** | **6.63** | **6.64** | **6.64** | **6.65** | **6.65** |
| 1993 | 0.00 | 0.16 | 0.72 | 1.59 | 2.75 | 3.78 | 4.55 | 5.07 | 5.34 | 5.52 | 5.64 | 5.71 | 5.75 | 5.77 | 5.79 | 5.81 | 5.82 | 5.84 | **5.85** | **5.88** | **5.89** | **5.90** | **5.91** | **5.92** | **5.93** | **5.93** | **5.94** | **5.94** | **5.94** | **5.95** |
| 1994 | 0.00 | 0.21 | 0.92 | 2.09 | 3.37 | 4.38 | 5.03 | 5.39 | 5.63 | 5.80 | 5.90 | 5.96 | 6.00 | 6.02 | 6.04 | 6.07 | 6.10 | **6.12** | **6.15** | **6.17** | **6.18** | **6.20** | **6.21** | **6.21** | **6.22** | **6.23** | **6.23** | **6.24** | **6.24** | **6.24** |
| 1995 | 0.01 | 0.29 | 1.49 | 3.28 | 4.91 | 6.00 | 6.67 | 7.11 | 7.48 | 7.71 | 7.83 | 7.90 | 7.95 | 8.00 | 8.04 | 8.09 | **8.12** | **8.16** | **8.19** | **8.22** | **8.24** | **8.25** | **8.26** | **8.28** | **8.28** | **8.29** | **8.30** | **8.31** | **8.31** | **8.32** |
| 1996 | 0.00 | 0.31 | 1.59 | 3.33 | 4.68 | 5.53 | 6.12 | 6.61 | 6.90 | 7.07 | 7.16 | 7.23 | 7.28 | 7.33 | 7.39 | **7.43** | **7.49** | **7.53** | **7.57** | **7.59** | **7.61** | **7.63** | **7.64** | **7.65** | **7.66** | **7.66** | **7.67** | **7.68** | **7.68** | **7.68** |
| 1997 | 0.01 | 0.40 | 1.75 | 3.23 | 4.30 | 5.12 | 5.78 | 6.18 | 6.40 | 6.54 | 6.63 | 6.70 | 6.77 | 6.85 | **6.89** | **6.96** | **7.01** | **7.05** | **7.08** | **7.10** | **7.12** | **7.14** | **7.15** | **7.16** | **7.17** | **7.18** | **7.18** | **7.19** | **7.19** | **7.19** |
| 1998 | 0.01 | 0.34 | 1.36 | 2.39 | 3.29 | 4.11 | 4.63 | 4.93 | 5.12 | 5.24 | 5.34 | 5.43 | 5.54 | **5.61** | **5.72** | **5.79** | **5.85** | **5.88** | **5.91** | **5.93** | **5.95** | **5.96** | **5.98** | **5.99** | **6.00** | **6.00** | **6.01** | **6.02** | **6.02** | **6.03** |
| 1999 | 0.01 | 0.33 | 1.16 | 2.23 | 3.40 | 4.19 | 4.67 | 4.93 | 5.11 | 5.25 | 5.39 | 5.54 | **5.64** | **5.80** | **5.89** | **5.97** | **6.01** | **6.04** | **6.07** | **6.09** | **6.11** | **6.13** | **6.14** | **6.16** | **6.17** | **6.17** | **6.18** | **6.19** | **6.19** | **6.20** |
| 2000 | 0.01 | 0.50 | 1.89 | 3.65 | 4.86 | 5.52 | 5.89 | 6.14 | 6.34 | 6.51 | 6.69 | **6.80** | **6.95** | **7.05** | **7.14** | **7.19** | **7.23** | **7.26** | **7.29** | **7.31** | **7.33** | **7.34** | **7.36** | **7.37** | **7.38** | **7.39** | **7.39** | **7.40** | **7.40** | **7.41** |
| 2001 | 0.01 | 0.42 | 1.76 | 3.13 | 4.02 | 4.55 | 4.88 | 5.16 | 5.39 | 5.64 | **5.80** | **6.04** | **6.18** | **6.30** | **6.36** | **6.40** | **6.44** | **6.47** | **6.49** | **6.52** | **6.53** | **6.55** | **6.56** | **6.57** | **6.58** | **6.59** | **6.60** | **6.60** | **6.61** | **6.62** |
| 2002 | 0.01 | 0.47 | 1.71 | 2.83 | 3.57 | 4.09 | 4.52 | 4.89 | 5.30 | **5.57** | **6.00** | **6.23** | **6.42** | **6.51** | **6.58** | **6.64** | **6.68** | **6.72** | **6.75** | **6.78** | **6.81** | **6.83** | **6.84** | **6.86** | **6.87** | **6.88** | **6.89** | **6.90** | **6.91** | **6.91** |
| 2003 | 0.01 | 0.63 | 1.75 | 2.69 | 3.41 | 4.06 | 4.69 | 5.42 | **5.93** | **6.73** | **7.17** | **7.52** | **7.71** | **7.83** | **7.93** | **8.01** | **8.07** | **8.13** | **8.18** | **8.22** | **8.25** | **8.28** | **8.30** | **8.32** | **8.34** | **8.36** | **8.37** | **8.39** | **8.40** | **8.41** |
| 2004 | 0.12 | 0.95 | 2.01 | 3.05 | 4.12 | 5.16 | 6.33 | **7.22** | **8.63** | **9.42** | **10.08** | **10.41** | **10.65** | **10.82** | **10.96** | **11.08** | **11.17** | **11.25** | **11.33** | **11.38** | **11.43** | **11.47** | **11.51** | **11.54** | **11.56** | **11.59** | **11.62** | **11.64** | **11.66** | **11.67** |
| 2005 | 0.11 | 0.82 | 2.31 | 4.20 | 6.26 | 8.48 | **10.02** | **12.39** | **13.74** | **14.89** | **15.49** | **15.89** | **16.18** | **16.39** | **16.57** | **16.71** | **16.82** | **16.92** | **17.00** | **17.06** | **17.12** | **17.16** | **17.20** | **17.23** | **17.27** | **17.30** | **17.33** | **17.35** | **17.36** | **17.38** |
| 2006 | 0.02 | 0.63 | 2.63 | 5.62 | 9.11 | **11.32** | **14.80** | **16.82** | **18.58** | **19.50** | **20.14** | **20.59** | **20.91** | **21.16** | **21.35** | **21.51** | **21.64** | **21.74** | **21.83** | **21.90** | **21.96** | **22.00** | **22.05** | **22.10** | **22.14** | **22.17** | **22.20** | **22.22** | **22.24** | **22.25** |
| 2007 | 0.02 | 0.83 | 3.59 | 7.55 | **10.34** | **15.26** | **18.07** | **20.55** | **21.88** | **22.80** | **23.45** | **23.92** | **24.28** | **24.55** | **24.76** | **24.93** | **25.07** | **25.17** | **25.26** | **25.34** | **25.39** | **25.45** | **25.51** | **25.56** | **25.60** | **25.63** | **25.66** | **25.68** | **25.70** | **25.72** |
| 2008 | 0.01 | 0.69 | 3.19 | **5.70** | **10.42** | **13.25** | **15.77** | **17.13** | **18.07** | **18.74** | **19.21** | **19.56** | **19.82** | **20.03** | **20.19** | **20.32** | **20.42** | **20.50** | **20.57** | **20.62** | **20.68** | **20.73** | **20.78** | **20.82** | **20.85** | **20.87** | **20.90** | **20.91** | **20.93** | **20.94** |
| 2009 | 0.01 | 0.47 | **1.55** | **4.22** | **6.43** | **8.55** | **9.76** | **10.59** | **11.15** | **11.55** | **11.84** | **12.06** | **12.22** | **12.35** | **12.45** | **12.53** | **12.60** | **12.66** | **12.70** | **12.75** | **12.79** | **12.83** | **12.86** | **12.89** | **12.91** | **12.93** | **12.94** | **12.96** | **12.97** | **12.98** |
| 2010 | 0.01 | **0.24** | **1.50** | **3.01** | **4.68** | **5.67** | **6.38** | **6.88** | **7.26** | **7.54** | **7.75** | **7.92** | **8.05** | **8.16** | **8.25** | **8.32** | **8.38** | **8.43** | **8.48** | **8.53** | **8.57** | **8.61** | **8.64** | **8.67** | **8.69** | **8.70** | **8.72** | **8.73** | **8.74** | **8.75** |
| 2011 | **0.02** | **0.45** | **1.39** | **2.69** | **3.57** | **4.21** | **4.69** | **5.05** | **5.34** | **5.55** | **5.73** | **5.87** | **5.99** | **6.08** | **6.16** | **6.22** | **6.28** | **6.33** | **6.38** | **6.43** | **6.46** | **6.49** | **6.52** | **6.54** | **6.56** | **6.57** | **6.58** | **6.59** | **6.60** | **6.61** |
| 2012 | **0.02** | **0.32** | **1.18** | **1.98** | **2.69** | **3.26** | **3.72** | **4.09** | **4.38** | **4.62** | **4.82** | **4.98** | **5.10** | **5.21** | **5.29** | **5.36** | **5.42** | **5.48** | **5.54** | **5.58** | **5.61** | **5.64** | **5.67** | **5.69** | **5.70** | **5.72** | **5.73** | **5.73** | **5.74** | **5.75** |
| 2013 | **0.01** | **0.36** | **1.08** | **1.97** | **2.81** | **3.50** | **4.06** | **4.51** | **4.88** | **5.17** | **5.40** | **5.58** | **5.72** | **5.84** | **5.93** | **6.02** | **6.10** | **6.17** | **6.22** | **6.27** | **6.30** | **6.33** | **6.36** | **6.38** | **6.39** | **6.41** | **6.42** | **6.43** | **6.43** | **6.44** |
| 2014 | **0.01** | **0.29** | **1.03** | **1.96** | **2.85** | **3.61** | **4.24** | **4.76** | **5.18** | **5.51** | **5.77** | **5.98** | **6.14** | **6.27** | **6.39** | **6.50** | **6.60** | **6.68** | **6.74** | **6.79** | **6.84** | **6.87** | **6.90** | **6.92** | **6.94** | **6.96** | **6.97** | **6.98** | **6.99** | **6.99** |
| 2015 | **0.01** | **0.31** | **1.10** | **2.11** | **3.10** | **3.94** | **4.65** | **5.24** | **5.71** | **6.07** | **6.36** | **6.58** | **6.75** | **6.92** | **7.08** | **7.21** | **7.31** | **7.40** | **7.47** | **7.53** | **7.58** | **7.61** | **7.65** | **7.67** | **7.69** | **7.71** | **7.72** | **7.73** | **7.74** | **7.75** |
| 2016 | **0.01** | **0.32** | **1.14** | **2.21** | **3.26** | **4.16** | **4.92** | **5.53** | **6.02** | **6.39** | **6.67** | **6.89** | **7.09** | **7.29** | **7.44** | **7.57** | **7.67** | **7.76** | **7.83** | **7.88** | **7.93** | **7.96** | **7.99** | **8.02** | **8.04** | **8.06** | **8.07** | **8.08** | **8.09** | **8.10** |
| 2017 | **0.01** | **0.34** | **1.22** | **2.37** | **3.50** | **4.46** | **5.26** | **5.89** | **6.39** | **6.76** | **7.04** | **7.30** | **7.54** | **7.73** | **7.89** | **8.02** | **8.12** | **8.21** | **8.28** | **8.33** | **8.38** | **8.42** | **8.45** | **8.47** | **8.49** | **8.51** | **8.52** | **8.53** | **8.54** | **8.55** |
| 2018 | **0.01** | **0.34** | **1.24** | **2.41** | **3.56** | **4.54** | **5.34** | **5.97** | **6.45** | **6.82** | **7.14** | **7.44** | **7.69** | **7.88** | **8.04** | **8.16** | **8.26** | **8.34** | **8.41** | **8.46** | **8.51** | **8.55** | **8.57** | **8.60** | **8.62** | **8.63** | **8.65** | **8.66** | **8.67** | **8.67** |

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1982 | 0.41 | 20.10 | 28.17 | 37.86 | 55.92 | 66.01 | 68.93 | 70.52 | 71.61 | 72.47 | 73.41 | 74.26 | 75.03 | 75.33 | 75.66 | 75.98 | 76.29 | 76.71 | 76.86 | 77.04 | 77.27 | 77.35 | 77.44 | 77.50 | 77.59 | 77.74 | 77.76 | 77.77 | 77.80 | **77.85** |
| 1983 | 0.35 | 1.19 | 3.29 | 21.05 | 42.99 | 49.25 | 53.23 | 57.31 | 61.53 | 67.32 | 71.74 | 75.12 | 76.17 | 77.26 | 78.18 | 79.56 | 80.38 | 80.72 | 81.00 | 81.33 | 81.66 | 81.87 | 82.01 | 82.11 | 82.20 | 82.32 | 82.36 | 82.40 | **82.45** | **82.53** |
| 1984 | 0.26 | 1.75 | 22.19 | 43.69 | 50.30 | 54.53 | 58.36 | 61.77 | 66.16 | 69.81 | 72.78 | 73.72 | 74.67 | 75.42 | 76.39 | 77.45 | 77.76 | 78.02 | 78.31 | 78.60 | 78.84 | 78.98 | 79.19 | 79.26 | 79.36 | 79.53 | 79.58 | **79.62** | **79.70** | **79.77** |
| 1985 | 0.34 | 12.44 | 34.65 | 41.97 | 46.86 | 52.00 | 57.17 | 64.51 | 70.11 | 73.96 | 75.01 | 76.10 | 76.93 | 77.85 | 78.76 | 79.74 | 80.03 | 80.35 | 80.64 | 80.88 | 81.06 | 81.32 | 81.39 | 81.47 | 81.64 | 81.71 | **81.75** | **81.82** | **81.88** | **81.93** |
| 1986 | 0.58 | 4.67 | 7.51 | 10.72 | 14.97 | 19.83 | 31.34 | 48.46 | 59.95 | 62.40 | 65.75 | 68.21 | 71.72 | 74.89 | 76.47 | 78.72 | 80.31 | 81.77 | 82.70 | 83.28 | 83.96 | 84.20 | 84.38 | 84.61 | 84.74 | **84.83** | **84.94** | **85.03** | **85.10** | **85.15** |
| 1987 | 0.25 | 1.24 | 3.08 | 6.06 | 9.45 | 17.54 | 33.90 | 47.42 | 50.67 | 55.25 | 58.74 | 64.12 | 69.44 | 71.76 | 74.72 | 78.32 | 81.39 | 83.16 | 84.22 | 85.26 | 85.73 | 86.05 | 86.37 | 86.60 | **86.75** | **86.90** | **87.01** | **87.11** | **87.18** | **87.25** |
| 1988 | 0.30 | 1.64 | 4.78 | 9.42 | 23.20 | 44.56 | 58.51 | 61.40 | 65.33 | 68.11 | 71.91 | 75.49 | 77.12 | 78.81 | 80.88 | 82.93 | 84.08 | 84.78 | 85.55 | 85.86 | 86.10 | 86.28 | 86.41 | **86.51** | **86.65** | **86.76** | **86.84** | **86.90** | **86.96** | **87.00** |
| 1989 | 0.31 | 2.16 | 6.43 | 21.84 | 45.90 | 60.85 | 63.70 | 67.53 | 70.18 | 73.91 | 77.36 | 78.89 | 80.52 | 82.45 | 84.27 | 85.57 | 86.26 | 86.98 | 87.24 | 87.43 | 87.61 | 87.72 | **87.81** | **87.94** | **88.05** | **88.13** | **88.19** | **88.24** | **88.28** | **88.32** |
| 1990 | 0.32 | 2.23 | 12.51 | 41.22 | 59.20 | 62.32 | 66.62 | 69.50 | 73.71 | 77.61 | 79.25 | 81.07 | 83.30 | 85.31 | 86.67 | 87.55 | 88.39 | 88.68 | 88.87 | 89.05 | 89.18 | **89.27** | **89.40** | **89.51** | **89.58** | **89.64** | **89.69** | **89.74** | **89.78** | **89.81** |
| 1991 | 0.34 | 5.90 | 32.56 | 53.42 | 56.88 | 62.07 | 65.61 | 70.99 | 75.85 | 77.78 | 80.15 | 82.95 | 85.52 | 87.07 | 88.03 | 89.05 | 89.38 | 89.59 | 89.78 | 89.90 | **90.00** | **90.14** | **90.26** | **90.34** | **90.41** | **90.47** | **90.52** | **90.57** | **90.60** | **90.64** |
| 1992 | 0.52 | 9.13 | 24.54 | 29.42 | 37.40 | 43.45 | 53.51 | 62.91 | 66.52 | 71.37 | 77.01 | 82.45 | 85.32 | 86.91 | 88.06 | 88.95 | 89.35 | 89.62 | 89.83 | **89.99** | **90.21** | **90.36** | **90.48** | **90.60** | **90.70** | **90.79** | **90.86** | **90.93** | **90.99** | **91.04** |
| 1993 | 1.27 | 7.50 | 11.82 | 19.29 | 25.76 | 36.23 | 47.48 | 52.66 | 59.82 | 68.72 | 78.77 | 83.26 | 85.66 | 87.21 | 88.35 | 89.53 | 89.90 | 90.20 | **90.39** | **90.67** | **90.81** | **90.93** | **91.05** | **91.15** | **91.23** | **91.31** | **91.37** | **91.43** | **91.48** | **91.53** |
| 1994 | 0.81 | 3.64 | 10.56 | 17.22 | 28.11 | 39.16 | 44.79 | 52.73 | 62.11 | 73.84 | 79.49 | 82.64 | 84.62 | 85.92 | 87.22 | 88.24 | 88.62 | **88.89** | **89.26** | **89.46** | **89.61** | **89.76** | **89.88** | **89.98** | **90.07** | **90.16** | **90.23** | **90.29** | **90.35** | **90.40** |
| 1995 | 1.92 | 11.61 | 20.35 | 37.34 | 49.75 | 54.54 | 61.77 | 69.66 | 77.45 | 81.69 | 84.14 | 85.63 | 86.55 | 87.06 | 87.45 | 87.82 | **88.00** | **88.30** | **88.48** | **88.63** | **88.78** | **88.89** | **88.99** | **89.08** | **89.16** | **89.23** | **89.30** | **89.35** | **89.40** | **89.44** |
| 1996 | 0.60 | 4.81 | 22.65 | 38.45 | 44.30 | 53.64 | 64.01 | 74.89 | 80.38 | 83.48 | 85.28 | 86.36 | 87.00 | 87.42 | 87.81 | **88.13** | **88.48** | **88.67** | **88.83** | **88.98** | **89.10** | **89.20** | **89.30** | **89.38** | **89.45** | **89.51** | **89.57** | **89.62** | **89.66** | **89.70** |
| 1997 | 0.96 | 15.65 | 36.20 | 43.20 | 54.96 | 65.53 | 75.81 | 81.13 | 84.19 | 85.99 | 87.07 | 87.70 | 88.07 | 88.33 | **88.59** | **89.00** | **89.21** | **89.39** | **89.57** | **89.71** | **89.83** | **89.93** | **90.02** | **90.10** | **90.17** | **90.24** | **90.29** | **90.34** | **90.38** | **90.41** |
| 1998 | 1.89 | 11.94 | 18.62 | 31.70 | 47.71 | 67.66 | 76.81 | 81.70 | 84.34 | 85.87 | 86.78 | 87.41 | 87.86 | **88.27** | **88.88** | **89.15** | **89.35** | **89.53** | **89.68** | **89.80** | **89.91** | **90.01** | **90.11** | **90.19** | **90.26** | **90.32** | **90.38** | **90.42** | **90.46** | **90.50** |
| 1999 | 0.85 | 4.24 | 16.93 | 35.57 | 60.27 | 71.86 | 78.24 | 81.58 | 83.50 | 84.63 | 85.47 | 86.06 | **86.62** | **87.38** | **87.77** | **88.04** | **88.25** | **88.41** | **88.55** | **88.68** | **88.79** | **88.89** | **88.98** | **89.07** | **89.14** | **89.20** | **89.25** | **89.30** | **89.34** | **89.38** |
| 2000 | 0.97 | 29.96 | 54.64 | 71.21 | 78.82 | 83.11 | 85.41 | 86.76 | 87.45 | 87.86 | 88.13 | **88.38** | **88.85** | **89.13** | **89.38** | **89.59** | **89.74** | **89.87** | **89.98** | **90.08** | **90.17** | **90.24** | **90.31** | **90.36** | **90.41** | **90.45** | **90.49** | **90.52** | **90.54** | **90.57** |
| 2001 | 5.63 | 26.55 | 60.36 | 73.35 | 79.90 | 83.15 | 84.88 | 85.89 | 86.67 | 87.14 | **87.57** | **88.20** | **88.51** | **88.79** | **89.05** | **89.24** | **89.39** | **89.53** | **89.65** | **89.76** | **89.86** | **89.94** | **90.01** | **90.08** | **90.13** | **90.18** | **90.22** | **90.26** | **90.29** | **90.32** |
| 2002 | 4.14 | 39.74 | 58.80 | 69.54 | 75.00 | 78.20 | 80.01 | 81.46 | 82.39 | **83.22** | **84.20** | **84.73** | **85.18** | **85.60** | **85.96** | **86.22** | **86.44** | **86.62** | **86.80** | **86.95** | **87.09** | **87.20** | **87.30** | **87.39** | **87.46** | **87.53** | **87.59** | **87.64** | **87.69** | **87.73** |
| 2003 | 9.59 | 28.82 | 46.46 | 55.76 | 61.18 | 64.30 | 67.13 | 69.16 | **71.17** | **72.85** | **73.96** | **74.72** | **75.36** | **75.97** | **76.55** | **76.93** | **77.22** | **77.48** | **77.72** | **77.93** | **78.11** | **78.26** | **78.40** | **78.52** | **78.62** | **78.71** | **78.80** | **78.88** | **78.95** | **79.01** |
| 2004 | 7.17 | 26.52 | 38.76 | 46.21 | 50.17 | 53.53 | 56.02 | **58.55** | **60.86** | **62.49** | **63.57** | **64.51** | **65.41** | **66.25** | **67.00** | **67.49** | **67.90** | **68.26** | **68.58** | **68.85** | **69.08** | **69.29** | **69.46** | **69.61** | **69.76** | **69.89** | **70.01** | **70.11** | **70.20** | **70.27** |
| 2005 | 7.16 | 18.04 | 26.94 | 32.31 | 36.93 | 40.17 | **42.64** | **44.38** | **45.67** | **46.61** | **47.47** | **48.30** | **49.07** | **49.80** | **50.46** | **50.99** | **51.43** | **51.81** | **52.15** | **52.44** | **52.70** | **52.92** | **53.12** | **53.30** | **53.47** | **53.61** | **53.74** | **53.86** | **53.96** | **54.05** |
| 2006 | 1.41 | 9.04 | 17.29 | 27.19 | 32.29 | **35.32** | **36.87** | **37.91** | **38.70** | **39.39** | **40.07** | **40.72** | **41.37** | **42.00** | **42.64** | **43.20** | **43.67** | **44.09** | **44.45** | **44.78** | **45.06** | **45.30** | **45.54** | **45.76** | **45.96** | **46.13** | **46.29** | **46.43** | **46.55** | **46.65** |
| 2007 | 1.44 | 12.66 | 26.45 | 32.15 | **35.07** | **36.52** | **37.42** | **38.11** | **38.70** | **39.29** | **39.85** | **40.43** | **41.00** | **41.60** | **42.21** | **42.74** | **43.18** | **43.57** | **43.92** | **44.22** | **44.48** | **44.74** | **44.97** | **45.18** | **45.37** | **45.54** | **45.68** | **45.81** | **45.92** | **46.02** |
| 2008 | 2.12 | 24.21 | 33.71 | **38.06** | **39.76** | **40.90** | **41.70** | **42.39** | **43.07** | **43.73** | **44.38** | **45.02** | **45.67** | **46.33** | **46.97** | **47.51** | **47.96** | **48.35** | **48.69** | **48.98** | **49.27** | **49.54** | **49.77** | **49.98** | **50.17** | **50.33** | **50.48** | **50.60** | **50.71** | **50.81** |
| 2009 | 6.17 | 14.70 | **20.68** | **23.99** | **26.44** | **28.11** | **29.61** | **31.11** | **32.59** | **34.02** | **35.37** | **36.64** | **37.83** | **38.95** | **40.00** | **40.86** | **41.53** | **42.12** | **42.63** | **43.13** | **43.60** | **44.01** | **44.38** | **44.70** | **44.99** | **45.24** | **45.46** | **45.66** | **45.83** | **45.98** |
| 2010 | 1.82 | **6.57** | **11.41** | **15.37** | **18.10** | **20.61** | **23.06** | **25.41** | **27.59** | **29.58** | **31.38** | **33.03** | **34.55** | **35.96** | **37.30** | **38.31** | **39.09** | **39.77** | **40.43** | **41.05** | **41.60** | **42.09** | **42.51** | **42.89** | **43.23** | **43.53** | **43.79** | **44.02** | **44.23** | **44.42** |
| 2011 | **1.52** | **7.61** | **12.80** | **16.81** | **20.16** | **23.32** | **26.22** | **28.86** | **31.25** | **33.44** | **35.44** | **37.29** | **38.99** | **40.59** | **42.13** | **43.23** | **44.01** | **44.75** | **45.44** | **46.05** | **46.57** | **47.04** | **47.44** | **47.80** | **48.12** | **48.40** | **48.64** | **48.86** | **49.05** | **49.22** |
| 2012 | **3.73** | **11.20** | **19.94** | **27.64** | **33.65** | **38.54** | **42.76** | **46.42** | **49.64** | **52.48** | **54.86** | **56.93** | **58.81** | **60.55** | **62.17** | **63.24** | **64.05** | **64.81** | **65.45** | **66.00** | **66.47** | **66.88** | **67.23** | **67.54** | **67.81** | **68.05** | **68.26** | **68.43** | **68.59** | **68.72** |
| 2013 | **3.32** | **15.31** | **27.14** | **36.73** | **43.72** | **49.68** | **54.76** | **59.19** | **62.93** | **65.98** | **68.47** | **70.60** | **72.51** | **74.25** | **75.82** | **76.94** | **77.75** | **78.43** | **79.01** | **79.51** | **79.93** | **80.29** | **80.60** | **80.87** | **81.09** | **81.29** | **81.46** | **81.60** | **81.73** | **81.83** |
| 2014 | **2.79** | **12.46** | **21.96** | **29.92** | **36.37** | **41.99** | **47.04** | **51.53** | **55.40** | **58.60** | **61.28** | **63.58** | **65.59** | **67.38** | **69.18** | **70.46** | **71.33** | **72.07** | **72.70** | **73.23** | **73.68** | **74.06** | **74.39** | **74.68** | **74.93** | **75.14** | **75.32** | **75.48** | **75.62** | **75.74** |
| 2015 | **2.80** | **11.85** | **20.57** | **28.41** | **34.75** | **40.28** | **45.26** | **49.55** | **53.09** | **56.04** | **58.52** | **60.64** | **62.53** | **64.43** | **66.28** | **67.52** | **68.37** | **69.10** | **69.71** | **70.23** | **70.66** | **71.04** | **71.36** | **71.64** | **71.89** | **72.09** | **72.27** | **72.42** | **72.56** | **72.68** |
| 2016 | **2.87** | **11.81** | **20.83** | **28.87** | **35.50** | **41.39** | **46.35** | **50.44** | **53.87** | **56.79** | **59.23** | **61.34** | **63.41** | **65.41** | **67.19** | **68.35** | **69.15** | **69.83** | **70.40** | **70.89** | **71.31** | **71.67** | **71.99** | **72.25** | **72.48** | **72.67** | **72.84** | **72.98** | **73.11** | **73.23** |
| 2017 | **2.70** | **11.58** | **20.63** | **28.90** | **35.76** | **41.52** | **46.34** | **50.29** | **53.60** | **56.45** | **58.85** | **61.15** | **63.35** | **65.31** | **67.07** | **68.24** | **69.04** | **69.72** | **70.30** | **70.80** | **71.22** | **71.57** | **71.88** | **72.15** | **72.37** | **72.56** | **72.73** | **72.88** | **73.01** | **73.13** |
| 2018 | **2.69** | **11.49** | **20.47** | **28.72** | **35.26** | **40.63** | **45.19** | **48.93** | **52.14** | **54.91** | **57.48** | **59.89** | **62.04** | **63.96** | **65.72** | **66.89** | **67.68** | **68.36** | **68.93** | **69.42** | **69.83** | **70.18** | **70.48** | **70.74** | **70.97** | **71.17** | **71.34** | **71.50** | **71.64** | **71.76** |

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1982 | 0.10 | 1.82 | 4.02 | 5.28 | 6.33 | 8.38 | 8.64 | 5.44 | 3.26 | 2.24 | 1.94 | 1.45 | 1.25 | 1.01 | 0.69 | 0.62 | 0.57 | 0.30 | 0.19 | 0.13 | 0.16 | 0.15 | 0.08 | 0.08 | 0.02 | 0.01 | 0.00 | 0.01 | 0.01 | **0.02** |
| 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 | 0.46 | 0.39 | 0.21 | 0.23 | 0.17 | 0.10 | 0.08 | 0.05 | 0.05 | 0.03 | 0.04 | **0.03** | **0.05** |
| 1984 | 0.03 | 1.00 | 2.88 | 5.13 | 7.62 | 6.60 | 4.60 | 3.46 | 3.04 | 2.70 | 2.66 | 2.28 | 1.75 | 1.63 | 1.22 | 1.02 | 0.80 | 0.54 | 0.36 | 0.27 | 0.18 | 0.14 | 0.12 | 0.09 | 0.06 | 0.08 | 0.07 | **0.06** | **0.08** | **0.07** |
| 1985 | 0.02 | 0.88 | 3.43 | 6.35 | 5.73 | 4.29 | 3.62 | 3.28 | 3.29 | 3.18 | 3.03 | 2.14 | 2.07 | 1.74 | 1.20 | 1.23 | 0.72 | 0.54 | 0.37 | 0.31 | 0.21 | 0.15 | 0.11 | 0.16 | 0.15 | 0.10 | **0.07** | **0.11** | **0.11** | **0.11** |
| 1986 | 0.01 | 0.48 | 1.84 | 2.31 | 2.15 | 1.95 | 1.76 | 1.66 | 1.88 | 1.96 | 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 | 0.16 | 0.19 | **0.18** | **0.16** | **0.17** | **0.19** | **0.11** |
| 1987 | 0.01 | 0.36 | 1.06 | 1.28 | 1.30 | 1.31 | 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 | 0.17 | 0.15 | 0.24 | 0.23 | **0.21** | **0.20** | **0.22** | **0.23** | **0.14** | **0.11** |
| 1988 | 0.01 | 0.37 | 1.07 | 1.50 | 1.78 | 1.87 | 2.35 | 2.58 | 2.14 | 2.10 | 1.87 | 1.74 | 1.46 | 0.89 | 0.75 | 0.68 | 0.66 | 0.47 | 0.39 | 0.24 | 0.29 | 0.32 | 0.32 | **0.29** | **0.25** | **0.27** | **0.30** | **0.19** | **0.15** | **0.12** |
| 1989 | 0.01 | 0.31 | 1.06 | 1.62 | 1.98 | 2.72 | 3.02 | 2.50 | 2.41 | 2.00 | 1.78 | 1.57 | 0.98 | 0.84 | 0.76 | 0.73 | 0.57 | 0.48 | 0.36 | 0.32 | 0.37 | 0.46 | **0.32** | **0.29** | **0.31** | **0.35** | **0.22** | **0.19** | **0.16** | **0.12** |
| 1990 | 0.01 | 0.28 | 1.07 | 1.76 | 2.61 | 2.91 | 2.37 | 2.45 | 2.10 | 1.85 | 1.58 | 1.03 | 0.81 | 0.78 | 0.72 | 0.55 | 0.49 | 0.47 | 0.46 | 0.40 | 0.60 | **0.40** | **0.48** | **0.37** | **0.42** | **0.27** | **0.23** | **0.20** | **0.17** | **0.12** |
| 1991 | 0.01 | 0.31 | 1.21 | 2.15 | 2.78 | 2.42 | 2.56 | 2.21 | 1.91 | 1.72 | 1.08 | 0.92 | 0.82 | 0.79 | 0.66 | 0.48 | 0.42 | 0.48 | 0.46 | 0.47 | **0.43** | **0.64** | **0.43** | **0.49** | **0.32** | **0.28** | **0.25** | **0.21** | **0.17** | **0.13** |
| 1992 | 0.01 | 0.22 | 0.85 | 1.40 | 1.43 | 1.76 | 1.69 | 1.61 | 1.41 | 1.00 | 0.78 | 0.70 | 0.68 | 0.60 | 0.48 | 0.38 | 0.45 | 0.41 | 0.45 | **0.47** | **0.74** | **0.59** | **0.61** | **0.40** | **0.36** | **0.32** | **0.28** | **0.24** | **0.20** | **0.17** |
| 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 | **0.43** | **0.80** | **0.60** | **0.56** | **0.34** | **0.31** | **0.26** | **0.24** | **0.21** | **0.18** | **0.16** | **0.13** |
| 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 | **0.50** | **0.86** | **0.61** | **0.58** | **0.36** | **0.32** | **0.28** | **0.25** | **0.22** | **0.19** | **0.17** | **0.16** | **0.13** |
| 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 | 0.88 | 0.88 | 0.96 | 1.22 | **0.82** | **1.22** | **0.88** | **0.90** | **0.58** | **0.53** | **0.47** | **0.42** | **0.36** | **0.32** | **0.29** | **0.26** | **0.22** | **0.17** |
| 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 | 0.97 | 1.24 | **0.86** | **1.50** | **1.09** | **1.02** | **0.61** | **0.53** | **0.45** | **0.39** | **0.34** | **0.29** | **0.26** | **0.24** | **0.20** | **0.17** | **0.13** |
| 1997 | 0.01 | 0.37 | 1.41 | 2.02 | 1.69 | 1.67 | 1.95 | 2.14 | 1.89 | 1.50 | 1.27 | 1.26 | 1.22 | 1.46 | **0.97** | **1.76** | **1.28** | **1.22** | **0.73** | **0.64** | **0.55** | **0.47** | **0.41** | **0.36** | **0.32** | **0.29** | **0.25** | **0.21** | **0.17** | **0.13** |
| 1998 | 0.01 | 0.30 | 1.11 | 1.27 | 1.37 | 1.70 | 1.91 | 1.78 | 1.53 | 1.24 | 1.21 | 1.30 | 1.56 | **1.18** | **2.03** | **1.32** | **1.19** | **0.70** | **0.60** | **0.50** | **0.43** | **0.38** | **0.33** | **0.30** | **0.27** | **0.23** | **0.19** | **0.16** | **0.13** | **0.10** |
| 1999 | 0.01 | 0.35 | 0.98 | 1.43 | 2.09 | 2.45 | 2.25 | 1.79 | 1.47 | 1.44 | 1.49 | 1.85 | **1.38** | **2.38** | **1.45** | **1.29** | **0.77** | **0.64** | **0.54** | **0.47** | **0.41** | **0.36** | **0.32** | **0.29** | **0.25** | **0.21** | **0.18** | **0.15** | **0.12** | **0.10** |
| 2000 | 0.01 | 0.49 | 2.07 | 4.24 | 5.19 | 4.47 | 3.65 | 3.02 | 2.96 | 2.76 | 3.25 | **2.11** | **3.34** | **2.53** | **2.44** | **1.46** | **1.28** | **1.11** | **0.95** | **0.83** | **0.72** | **0.64** | **0.57** | **0.50** | **0.42** | **0.36** | **0.30** | **0.25** | **0.23** | **0.22** |
| 2001 | 0.01 | 0.50 | 1.99 | 3.92 | 4.10 | 3.44 | 2.91 | 2.79 | 2.60 | 3.15 | **2.28** | **3.91** | **2.62** | **2.27** | **1.28** | **1.07** | **0.90** | **0.77** | **0.68** | **0.60** | **0.54** | **0.48** | **0.42** | **0.36** | **0.31** | **0.26** | **0.22** | **0.20** | **0.21** | **0.16** |
| 2002 | 0.01 | 0.52 | 2.30 | 3.21 | 2.98 | 2.60 | 2.42 | 2.43 | 3.05 | **2.39** | **4.22** | **2.65** | **2.21** | **1.23** | **0.96** | **0.80** | **0.69** | **0.60** | **0.54** | **0.48** | **0.43** | **0.38** | **0.32** | **0.27** | **0.23** | **0.20** | **0.19** | **0.20** | **0.16** | **0.13** |
| 2003 | 0.01 | 0.77 | 1.82 | 2.09 | 1.93 | 1.97 | 2.14 | 2.82 | **2.24** | **4.02** | **2.46** | **2.15** | **1.16** | **0.87** | **0.72** | **0.61** | **0.53** | **0.47** | **0.42** | **0.37** | **0.32** | **0.28** | **0.24** | **0.20** | **0.17** | **0.16** | **0.17** | **0.15** | **0.12** | **0.09** |
| 2004 | 0.12 | 0.96 | 1.58 | 1.85 | 2.19 | 2.36 | 3.00 | **2.62** | **4.59** | **2.92** | **2.62** | **1.42** | **1.05** | **0.85** | **0.71** | **0.61** | **0.53** | **0.48** | **0.42** | **0.36** | **0.31** | **0.27** | **0.23** | **0.19** | **0.19** | **0.20** | **0.17** | **0.14** | **0.11** | **0.08** |
| 2005 | 0.11 | 0.74 | 1.76 | 2.52 | 3.10 | 3.84 | **3.03** | **4.83** | **2.97** | **2.74** | **1.48** | **1.06** | **0.78** | **0.62** | **0.50** | **0.42** | **0.36** | **0.30** | **0.26** | **0.21** | **0.18** | **0.15** | **0.13** | **0.12** | **0.13** | **0.11** | **0.09** | **0.07** | **0.06** | **0.04** |
| 2006 | 0.01 | 0.56 | 2.17 | 3.68 | 5.18 | **3.77** | **6.43** | **4.05** | **3.80** | **2.10** | **1.52** | **1.12** | **0.85** | **0.65** | **0.52** | **0.44** | **0.36** | **0.30** | **0.25** | **0.21** | **0.17** | **0.14** | **0.14** | **0.15** | **0.12** | **0.10** | **0.09** | **0.07** | **0.06** | **0.04** |
| 2007 | 0.02 | 0.79 | 3.12 | 5.59 | **4.59** | **8.80** | **5.63** | **5.44** | **3.10** | **2.28** | **1.69** | **1.29** | **0.98** | **0.77** | **0.63** | **0.51** | **0.42** | **0.34** | **0.28** | **0.23** | **0.19** | **0.18** | **0.20** | **0.17** | **0.14** | **0.12** | **0.10** | **0.08** | **0.06** | **0.05** |
| 2008 | 0.01 | 0.65 | 3.24 | **3.92** | **8.15** | **5.45** | **5.31** | **3.07** | **2.27** | **1.68** | **1.26** | **0.96** | **0.74** | **0.61** | **0.49** | **0.39** | **0.32** | **0.26** | **0.22** | **0.18** | **0.17** | **0.19** | **0.16** | **0.13** | **0.11** | **0.09** | **0.08** | **0.06** | **0.05** | **0.04** |
| 2009 | 0.01 | 0.42 | **1.10** | **2.97** | **2.55** | **2.53** | **1.48** | **1.12** | **0.84** | **0.64** | **0.50** | **0.39** | **0.32** | **0.26** | **0.22** | **0.18** | **0.15** | **0.13** | **0.11** | **0.11** | **0.11** | **0.10** | **0.08** | **0.07** | **0.06** | **0.05** | **0.04** | **0.03** | **0.03** | **0.02** |
| 2010 | 0.00 | **0.19** | **1.10** | **1.44** | **1.65** | **0.98** | **0.76** | **0.60** | **0.48** | **0.39** | **0.31** | **0.26** | **0.22** | **0.18** | **0.16** | **0.13** | **0.11** | **0.10** | **0.10** | **0.10** | **0.09** | **0.07** | **0.06** | **0.05** | **0.04** | **0.04** | **0.03** | **0.02** | **0.02** | **0.02** |
| 2011 | **0.01** | **0.36** | **0.85** | **1.26** | **0.87** | **0.69** | **0.57** | **0.48** | **0.40** | **0.34** | **0.29** | **0.25** | **0.22** | **0.19** | **0.16** | **0.14** | **0.12** | **0.12** | **0.12** | **0.10** | **0.09** | **0.07** | **0.06** | **0.05** | **0.04** | **0.04** | **0.03** | **0.03** | **0.02** | **0.02** |
| 2012 | **0.02** | **0.30** | **0.96** | **0.99** | **1.01** | **0.91** | **0.81** | **0.72** | **0.64** | **0.56** | **0.49** | **0.43** | **0.37** | **0.32** | **0.27** | **0.23** | **0.23** | **0.23** | **0.20** | **0.17** | **0.14** | **0.12** | **0.10** | **0.08** | **0.07** | **0.06** | **0.05** | **0.04** | **0.03** | **0.03** |
| 2013 | **0.01** | **0.37** | **0.88** | **1.29** | **1.43** | **1.35** | **1.26** | **1.18** | **1.09** | **0.97** | **0.87** | **0.77** | **0.67** | **0.58** | **0.50** | **0.50** | **0.52** | **0.46** | **0.39** | **0.33** | **0.28** | **0.24** | **0.20** | **0.17** | **0.14** | **0.11** | **0.10** | **0.08** | **0.06** | **0.05** |
| 2014 | **0.01** | **0.29** | **0.87** | **1.25** | **1.37** | **1.29** | **1.22** | **1.13** | **1.02** | **0.90** | **0.78** | **0.67** | **0.58** | **0.50** | **0.49** | **0.51** | **0.45** | **0.38** | **0.32** | **0.27** | **0.23** | **0.19** | **0.16** | **0.14** | **0.11** | **0.09** | **0.07** | **0.06** | **0.05** | **0.04** |
| 2015 | **0.01** | **0.32** | **0.93** | **1.35** | **1.49** | **1.43** | **1.36** | **1.25** | **1.12** | **0.96** | **0.82** | **0.69** | **0.59** | **0.59** | **0.62** | **0.54** | **0.46** | **0.39** | **0.33** | **0.28** | **0.23** | **0.19** | **0.16** | **0.13** | **0.11** | **0.09** | **0.08** | **0.06** | **0.05** | **0.04** |
| 2016 | **0.01** | **0.32** | **0.97** | **1.44** | **1.62** | **1.57** | **1.49** | **1.35** | **1.19** | **1.00** | **0.84** | **0.72** | **0.71** | **0.73** | **0.64** | **0.55** | **0.47** | **0.40** | **0.34** | **0.28** | **0.24** | **0.20** | **0.17** | **0.14** | **0.12** | **0.09** | **0.08** | **0.06** | **0.05** | **0.04** |
| 2017 | **0.02** | **0.34** | **1.03** | **1.54** | **1.74** | **1.68** | **1.56** | **1.41** | **1.21** | **1.00** | **0.84** | **0.83** | **0.85** | **0.75** | **0.64** | **0.55** | **0.47** | **0.40** | **0.34** | **0.29** | **0.24** | **0.20** | **0.17** | **0.14** | **0.11** | **0.09** | **0.08** | **0.06** | **0.05** | **0.04** |
| 2018 | **0.02** | **0.35** | **1.05** | **1.57** | **1.77** | **1.68** | **1.54** | **1.37** | **1.16** | **0.96** | **0.93** | **0.94** | **0.82** | **0.71** | **0.61** | **0.52** | **0.44** | **0.37** | **0.31** | **0.26** | **0.22** | **0.19** | **0.15** | **0.13** | **0.11** | **0.09** | **0.07** | **0.06** | **0.05** | **0.04** |

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1982 | 0.41 | 19.80 | 10.36 | 14.52 | 33.73 | 31.46 | 15.11 | 10.80 | 8.75 | 7.90 | 9.41 | 9.72 | 9.82 | 4.46 | 4.86 | 4.33 | 5.38 | 7.71 | 2.87 | 2.53 | 2.49 | 1.94 | 1.95 | 1.19 | 1.29 | 0.97 | 0.46 | 0.37 | 0.55 | **0.97** |
| 1983 | 0.36 | 0.83 | 2.13 | 19.22 | 29.73 | 12.56 | 9.59 | 11.44 | 13.87 | 22.41 | 22.71 | 23.28 | 9.29 | 10.58 | 9.07 | 10.50 | 13.35 | 6.34 | 5.50 | 6.35 | 5.94 | 5.18 | 3.72 | 2.70 | 2.09 | 1.73 | 1.21 | 1.26 | **1.32** | **2.00** |
| 1984 | 0.26 | 1.49 | 21.41 | 29.35 | 13.74 | 11.14 | 12.14 | 12.76 | 19.19 | 20.59 | 22.16 | 9.17 | 10.25 | 8.84 | 10.28 | 11.09 | 6.18 | 5.50 | 6.04 | 6.02 | 5.07 | 3.77 | 6.27 | 2.15 | 2.28 | 3.62 | 1.59 | **1.53** | **2.43** | **1.89** |
| 1985 | 0.35 | 12.25 | 25.78 | 12.05 | 9.85 | 12.20 | 14.54 | 24.70 | 26.18 | 25.82 | 9.67 | 11.42 | 9.80 | 12.25 | 12.93 | 7.24 | 6.74 | 7.77 | 7.69 | 6.39 | 4.69 | 9.04 | 2.72 | 2.95 | 6.01 | 2.13 | **1.64** | **2.89** | **2.47** | **1.60** |
| 1986 | 0.58 | 4.02 | 2.86 | 3.42 | 4.85 | 5.93 | 15.58 | 28.58 | 27.50 | 8.02 | 12.34 | 10.41 | 17.26 | 19.20 | 10.17 | 12.26 | 16.93 | 18.96 | 14.98 | 10.73 | 13.70 | 6.19 | 4.80 | 6.12 | 3.54 | **2.53** | **3.28** | **3.00** | **2.07** | **1.44** |
| 1987 | 0.24 | 0.93 | 1.80 | 3.02 | 3.60 | 9.23 | 21.15 | 22.45 | 6.87 | 10.74 | 9.24 | 16.21 | 19.44 | 10.24 | 13.36 | 19.22 | 24.29 | 18.61 | 13.77 | 15.58 | 7.67 | 6.30 | 6.61 | 5.06 | **3.35** | **3.66** | **2.85** | **2.31** | **1.82** | **1.37** |
| 1988 | 0.29 | 1.32 | 3.18 | 4.92 | 15.81 | 29.74 | 28.23 | 8.28 | 12.68 | 10.51 | 16.57 | 19.20 | 10.75 | 12.66 | 17.16 | 19.33 | 16.33 | 11.98 | 15.26 | 6.81 | 5.08 | 4.78 | 3.52 | **2.86** | **3.97** | **3.50** | **2.55** | **1.96** | **1.64** | **1.29** |
| 1989 | 0.31 | 1.85 | 4.37 | 16.81 | 32.15 | 30.22 | 8.49 | 12.91 | 10.53 | 17.12 | 19.65 | 10.95 | 13.22 | 18.39 | 20.52 | 17.82 | 13.32 | 16.24 | 7.04 | 5.09 | 4.68 | 3.41 | **3.07** | **4.50** | **3.77** | **2.90** | **2.28** | **1.95** | **1.65** | **1.31** |
| 1990 | 0.25 | 1.63 | 10.35 | 33.65 | 32.56 | 8.50 | 13.21 | 10.48 | 17.72 | 20.65 | 10.95 | 13.86 | 20.22 | 23.02 | 19.45 | 14.37 | 19.65 | 8.12 | 6.03 | 5.79 | 4.07 | **3.31** | **5.00** | **4.19** | **3.22** | **2.56** | **2.19** | **1.89** | **1.63** | **1.26** |
| 1991 | 0.28 | 5.14 | 29.48 | 33.26 | 7.87 | 13.34 | 10.52 | 18.89 | 21.66 | 10.77 | 14.81 | 21.69 | 26.13 | 21.65 | 15.77 | 19.03 | 8.75 | 6.24 | 6.33 | 4.10 | **3.51** | **5.44** | **4.41** | **3.51** | **2.85** | **2.44** | **2.12** | **1.88** | **1.58** | **1.24** |
| 1992 | 0.35 | 8.11 | 18.40 | 6.10 | 10.82 | 9.38 | 18.74 | 23.07 | 10.70 | 16.48 | 25.07 | 33.84 | 26.80 | 19.61 | 15.58 | 11.07 | 8.04 | 6.65 | 5.42 | **4.35** | **5.94** | **3.67** | **3.61** | **3.14** | **2.64** | **2.32** | **2.08** | **1.81** | **1.55** | **1.27** |
| 1993 | 0.63 | 4.14 | 3.74 | 7.06 | 7.24 | 13.31 | 17.95 | 10.16 | 15.64 | 25.11 | 40.40 | 30.68 | 23.07 | 16.83 | 12.31 | 9.21 | 7.84 | 6.62 | **5.00** | **6.50** | **3.05** | **3.06** | **3.13** | **2.44** | **2.02** | **2.15** | **1.90** | **1.67** | **1.52** | **1.17** |
| 1994 | 0.27 | 1.91 | 6.16 | 6.20 | 12.27 | 15.62 | 9.23 | 14.52 | 22.49 | 38.12 | 29.26 | 22.81 | 16.82 | 12.32 | 9.11 | 7.32 | 6.36 | **5.28** | **6.25** | **3.05** | **2.83** | **2.72** | **2.17** | **1.82** | **1.88** | **1.67** | **1.51** | **1.36** | **1.14** | **0.89** |
| 1995 | 2.01 | 9.46 | 7.32 | 17.93 | 20.17 | 9.57 | 16.26 | 24.66 | 34.89 | 28.83 | 23.30 | 18.06 | 13.06 | 8.61 | 5.95 | 5.25 | **4.61** | **7.44** | **4.33** | **4.15** | **3.69** | **3.08** | **2.67** | **2.54** | **2.28** | **2.07** | **1.93** | **1.66** | **1.41** | **1.12** |
| 1996 | 0.38 | 2.75 | 12.65 | 17.34 | 8.59 | 15.82 | 24.77 | 37.23 | 30.00 | 24.67 | 18.61 | 13.41 | 9.12 | 6.64 | 5.30 | **4.85** | **7.20** | **3.67** | **3.65** | **3.38** | **2.75** | **2.35** | **2.31** | **2.08** | **1.90** | **1.77** | **1.54** | **1.33** | **1.13** | **0.88** |
| 1997 | 0.71 | 11.17 | 18.61 | 7.96 | 16.23 | 25.35 | 36.78 | 29.81 | 24.32 | 18.20 | 12.84 | 9.00 | 6.32 | 4.90 | **4.85** | **7.80** | **4.20** | **4.20** | **3.73** | **3.09** | **2.67** | **2.54** | **2.30** | **2.09** | **1.98** | **1.72** | **1.51** | **1.31** | **1.11** | **0.87** |
| 1998 | 0.99 | 6.21 | 5.83 | 13.19 | 22.47 | 39.90 | 31.91 | 26.04 | 19.13 | 13.63 | 9.47 | 7.69 | 5.95 | **5.62** | **7.90** | **3.72** | **3.53** | **3.37** | **2.71** | **2.29** | **2.35** | **2.17** | **2.07** | **1.89** | **1.66** | **1.46** | **1.28** | **1.11** | **0.94** | **0.73** |
| 1999 | 0.52 | 2.79 | 12.10 | 22.12 | 38.91 | 31.48 | 26.30 | 19.06 | 13.65 | 9.47 | 7.96 | 6.14 | **6.01** | **7.77** | **3.89** | **3.61** | **3.24** | **2.69** | **2.30** | **2.27** | **2.07** | **1.99** | **1.83** | **1.62** | **1.43** | **1.26** | **1.10** | **0.96** | **0.81** | **0.67** |
| 2000 | 0.88 | 28.79 | 36.15 | 39.21 | 30.99 | 26.10 | 18.96 | 13.54 | 8.68 | 6.50 | 4.62 | **4.88** | **8.92** | **5.48** | **5.45** | **4.82** | **4.08** | **3.59** | **3.32** | **3.03** | **2.78** | **2.58** | **2.27** | **2.00** | **1.77** | **1.56** | **1.37** | **1.18** | **1.05** | **0.90** |
| 2001 | 5.40 | 19.79 | 45.19 | 33.58 | 26.85 | 19.20 | 13.16 | 9.33 | 8.63 | 5.88 | **5.78** | **8.61** | **4.45** | **4.57** | **4.38** | **3.69** | **3.18** | **3.16** | **2.95** | **2.83** | **2.60** | **2.29** | **2.02** | **1.79** | **1.58** | **1.39** | **1.21** | **1.13** | **1.05** | **0.83** |
| 2002 | 3.05 | 36.00 | 32.26 | 26.35 | 17.93 | 12.79 | 9.33 | 9.50 | 6.84 | **6.57** | **7.39** | **4.01** | **3.84** | **3.60** | **3.18** | **2.76** | **2.70** | **2.49** | **2.46** | **2.29** | **2.03** | **1.80** | **1.60** | **1.42** | **1.25** | **1.09** | **1.04** | **0.99** | **0.84** | **0.66** |
| 2003 | 6.35 | 19.33 | 23.89 | 16.39 | 11.76 | 8.12 | 8.57 | 7.01 | **7.24** | **5.37** | **4.06** | **3.16** | **2.58** | **2.44** | **2.20** | **2.00** | **1.80** | **1.73** | **1.63** | **1.46** | **1.30** | **1.16** | **1.03** | **0.90** | **0.79** | **0.76** | **0.73** | **0.63** | **0.53** | **0.41** |
| 2004 | 5.86 | 19.70 | 15.13 | 10.78 | 6.99 | 7.55 | 6.20 | **6.34** | **4.84** | **3.95** | **2.97** | **2.53** | **2.44** | **2.25** | **2.05** | **1.86** | **1.74** | **1.61** | **1.45** | **1.29** | **1.15** | **1.02** | **0.90** | **0.79** | **0.76** | **0.73** | **0.64** | **0.56** | **0.47** | **0.34** |
| 2005 | 6.23 | 9.75 | 9.02 | 6.41 | 7.41 | 5.92 | **4.91** | **2.85** | **2.28** | **1.76** | **1.54** | **1.53** | **1.50** | **1.40** | **1.28** | **1.21** | **1.13** | **1.02** | **0.91** | **0.82** | **0.73** | **0.64** | **0.56** | **0.55** | **0.53** | **0.47** | **0.41** | **0.35** | **0.30** | **0.22** |
| 2006 | 1.16 | 7.29 | 8.91 | 12.42 | 7.69 | **5.22** | **2.58** | **1.88** | **1.52** | **1.39** | **1.41** | **1.40** | **1.43** | **1.39** | **1.40** | **1.37** | **1.26** | **1.13** | **1.02** | **0.91** | **0.80** | **0.70** | **0.69** | **0.66** | **0.59** | **0.52** | **0.46** | **0.40** | **0.34** | **0.26** |
| 2007 | 1.26 | 10.92 | 15.76 | 8.08 | **4.81** | **2.48** | **1.72** | **1.41** | **1.30** | **1.35** | **1.33** | **1.41** | **1.44** | **1.49** | **1.53** | **1.44** | **1.31** | **1.18** | **1.06** | **0.94** | **0.82** | **0.80** | **0.77** | **0.68** | **0.61** | **0.54** | **0.47** | **0.41** | **0.33** | **0.26** |
| 2008 | 2.03 | 22.33 | 12.71 | **6.90** | **2.88** | **2.11** | **1.60** | **1.44** | **1.50** | **1.51** | **1.56** | **1.58** | **1.62** | **1.65** | **1.57** | **1.46** | **1.33** | **1.20** | **1.06** | **0.93** | **0.91** | **0.88** | **0.78** | **0.69** | **0.61** | **0.54** | **0.48** | **0.40** | **0.33** | **0.26** |
| 2009 | 6.94 | 9.23 | **7.04** | **4.04** | **3.18** | **2.29** | **2.11** | **2.20** | **2.25** | **2.25** | **2.18** | **2.10** | **2.00** | **1.84** | **1.68** | **1.51** | **1.35** | **1.20** | **1.07** | **1.06** | **1.03** | **0.92** | **0.82** | **0.73** | **0.65** | **0.57** | **0.50** | **0.43** | **0.37** | **0.29** |
| 2010 | 1.69 | **4.57** | **4.58** | **4.10** | **2.93** | **2.69** | **2.81** | **2.84** | **2.76** | **2.60** | **2.45** | **2.28** | **2.08** | **1.88** | **1.68** | **1.50** | **1.34** | **1.20** | **1.18** | **1.15** | **1.03** | **0.92** | **0.82** | **0.73** | **0.65** | **0.57** | **0.51** | **0.44** | **0.37** | **0.29** |
| 2011 | **1.59** | **5.73** | **5.17** | **4.38** | **3.68** | **3.71** | **3.60** | **3.42** | **3.23** | **3.12** | **2.96** | **2.77** | **2.45** | **2.18** | **1.93** | **1.72** | **1.53** | **1.50** | **1.46** | **1.29** | **1.14** | **1.01** | **0.90** | **0.80** | **0.71** | **0.63** | **0.55** | **0.48** | **0.40** | **0.31** |
| 2012 | **3.65** | **7.56** | **9.95** | **9.80** | **8.58** | **7.66** | **7.24** | **6.86** | **6.49** | **6.16** | **5.45** | **4.81** | **4.23** | **3.71** | **3.24** | **2.86** | **2.79** | **2.70** | **2.36** | **2.08** | **1.83** | **1.59** | **1.41** | **1.25** | **1.11** | **0.98** | **0.85** | **0.73** | **0.62** | **0.49** |
| 2013 | **3.27** | **12.56** | **14.06** | **13.54** | **11.55** | **11.29** | **10.98** | **10.93** | **10.42** | **9.54** | **8.57** | **7.66** | **6.88** | **6.13** | **5.37** | **5.27** | **5.07** | **4.51** | **4.02** | **3.57** | **3.18** | **2.81** | **2.48** | **2.18** | **1.87** | **1.66** | **1.41** | **1.20** | **1.01** | **0.78** |
| 2014 | **2.70** | **9.57** | **10.61** | **10.23** | **9.42** | **9.14** | **9.23** | **9.12** | **8.76** | **7.96** | **7.26** | **6.41** | **5.51** | **4.77** | **4.64** | **4.46** | **3.96** | **3.52** | **3.12** | **2.75** | **2.34** | **2.07** | **1.84** | **1.62** | **1.42** | **1.21** | **1.06** | **0.89** | **0.75** | **0.60** |
| 2015 | **2.59** | **8.53** | **9.31** | **9.73** | **8.83** | **8.58** | **8.61** | **8.26** | **7.50** | **6.82** | **6.18** | **5.43** | **4.79** | **4.67** | **4.50** | **3.97** | **3.52** | **3.12** | **2.74** | **2.39** | **2.05** | **1.82** | **1.59** | **1.41** | **1.22** | **1.05** | **0.91** | **0.78** | **0.67** | **0.54** |
| 2016 | **2.61** | **8.42** | **9.71** | **9.99** | **9.31** | **9.30** | **8.77** | **8.07** | **7.46** | **6.95** | **6.29** | **5.60** | **5.50** | **5.21** | **4.59** | **3.99** | **3.48** | **3.04** | **2.66** | **2.36** | **2.09** | **1.85** | **1.63** | **1.39** | **1.20** | **1.04** | **0.88** | **0.77** | **0.66** | **0.53** |
| 2017 | **2.48** | **8.47** | **9.79** | **10.31** | **9.69** | **9.16** | **8.61** | **7.80** | **7.18** | **6.77** | **6.19** | **6.11** | **5.91** | **5.23** | **4.64** | **4.09** | **3.48** | **3.09** | **2.74** | **2.43** | **2.11** | **1.83** | **1.61** | **1.40** | **1.19** | **1.04** | **0.91** | **0.80** | **0.68** | **0.55** |
| 2018 | **2.47** | **8.40** | **9.69** | **10.26** | **9.16** | **8.43** | **7.98** | **7.21** | **6.79** | **6.41** | **6.43** | **6.29** | **5.60** | **4.90** | **4.40** | **3.88** | **3.29** | **2.91** | **2.56** | **2.25** | **1.96** | **1.69** | **1.49** | **1.29** | **1.13** | **1.02** | **0.90** | **0.78** | **0.67** | **0.54** |

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1982 | 0.10 | 1.91 | 5.05 | 8.58 | 11.96 | 14.65 | 16.32 | 17.12 | 17.52 | 17.76 | 17.95 | 18.08 | 18.17 | 18.24 | 18.29 | 18.32 | 18.36 | 18.37 | 18.38 | 18.39 | 18.40 | 18.40 | 18.41 | 18.41 | 18.41 | 18.41 | 18.41 | 18.41 | 18.41 | **18.41** |
| 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** | **16.85** |
| 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** | **13.03** | **13.03** |
| 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** | **9.74** | **9.75** | **9.76** | **9.77** | **9.77** |
| 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** | **10.41** | **10.41** | **10.42** |
| 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** | **9.41** | **9.42** | **9.43** | **9.43** | **9.44** | **9.44** | **9.45** |
| 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 | **8.33** | **8.35** | **8.36** | **8.37** | **8.37** | **8.38** | **8.38** | **8.39** | **8.39** |
| 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 | **7.59** | **7.61** | **7.62** | **7.63** | **7.64** | **7.65** | **7.65** | **7.66** | **7.66** | **7.66** |
| 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** | **6.96** | **6.98** | **7.00** | **7.01** | **7.02** | **7.03** | **7.04** | **7.04** | **7.05** | **7.06** |
| 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 | **6.34** | **6.38** | **6.40** | **6.43** | **6.44** | **6.45** | **6.46** | **6.47** | **6.48** | **6.49** | **6.49** | **6.50** |
| 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 | 6.41 | 6.45 | 6.48 | 6.51 | 6.56 | **6.59** | **6.64** | **6.67** | **6.70** | **6.72** | **6.74** | **6.75** | **6.76** | **6.77** | **6.78** | **6.79** | **6.80** | **6.80** |
| 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 | **7.99** | **8.05** | **8.09** | **8.13** | **8.15** | **8.17** | **8.18** | **8.20** | **8.21** | **8.22** | **8.23** | **8.24** | **8.25** | **8.25** |
| 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 | **7.75** | **7.83** | **7.89** | **7.94** | **7.97** | **7.99** | **8.01** | **8.03** | **8.04** | **8.05** | **8.06** | **8.07** | **8.08** | **8.09** | **8.09** |
| 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 | **7.14** | **7.24** | **7.31** | **7.37** | **7.40** | **7.43** | **7.46** | **7.48** | **7.49** | **7.51** | **7.52** | **7.53** | **7.54** | **7.55** | **7.56** | **7.56** |
| 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 | **6.27** | **6.42** | **6.51** | **6.58** | **6.62** | **6.66** | **6.69** | **6.71** | **6.73** | **6.75** | **6.76** | **6.78** | **6.79** | **6.80** | **6.80** | **6.81** | **6.82** |
| 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 | **6.48** | **6.67** | **6.78** | **6.87** | **6.92** | **6.96** | **6.99** | **7.02** | **7.04** | **7.06** | **7.08** | **7.10** | **7.11** | **7.12** | **7.13** | **7.14** | **7.14** | **7.15** |
| 2000 | 0.01 | 0.50 | 1.95 | 3.79 | 5.06 | 5.75 | 6.14 | 6.40 | 6.60 | 6.77 | 6.95 | **7.06** | **7.22** | **7.32** | **7.42** | **7.47** | **7.51** | **7.55** | **7.58** | **7.60** | **7.62** | **7.64** | **7.65** | **7.66** | **7.67** | **7.68** | **7.69** | **7.69** | **7.70** | **7.71** |
| 2001 | 0.01 | 0.48 | 1.99 | 3.55 | 4.56 | 5.15 | 5.54 | 5.85 | 6.10 | 6.37 | **6.55** | **6.83** | **7.00** | **7.13** | **7.20** | **7.25** | **7.30** | **7.33** | **7.36** | **7.39** | **7.41** | **7.43** | **7.45** | **7.46** | **7.48** | **7.49** | **7.49** | **7.50** | **7.51** | **7.52** |
| 2002 | 0.01 | 0.52 | 1.93 | 3.23 | 4.07 | 4.65 | 5.11 | 5.51 | 5.96 | **6.28** | **6.78** | **7.06** | **7.28** | **7.40** | **7.48** | **7.55** | **7.61** | **7.65** | **7.69** | **7.73** | **7.76** | **7.79** | **7.81** | **7.83** | **7.84** | **7.86** | **7.87** | **7.88** | **7.89** | **7.90** |
| 2003 | 0.01 | 0.74 | 2.11 | 3.27 | 4.15 | 4.92 | 5.67 | 6.55 | **7.19** | **8.21** | **8.78** | **9.24** | **9.48** | **9.65** | **9.79** | **9.90** | **10.00** | **10.08** | **10.15** | **10.22** | **10.27** | **10.31** | **10.35** | **10.38** | **10.41** | **10.44** | **10.46** | **10.49** | **10.51** | **10.52** |
| 2004 | 0.12 | 1.03 | 2.21 | 3.36 | 4.55 | 5.71 | 7.05 | **8.10** | **9.78** | **10.75** | **11.56** | **11.98** | **12.27** | **12.50** | **12.69** | **12.84** | **12.98** | **13.09** | **13.19** | **13.28** | **13.35** | **13.41** | **13.46** | **13.50** | **13.55** | **13.59** | **13.63** | **13.66** | **13.69** | **13.71** |
| 2005 | 0.11 | 0.80 | 2.28 | 4.17 | 6.29 | 8.64 | **10.30** | **12.79** | **14.20** | **15.43** | **16.07** | **16.51** | **16.83** | **17.08** | **17.27** | **17.43** | **17.57** | **17.68** | **17.78** | **17.85** | **17.92** | **17.97** | **18.02** | **18.06** | **18.11** | **18.14** | **18.18** | **18.20** | **18.22** | **18.24** |
| 2006 | 0.01 | 0.57 | 2.56 | 5.55 | 9.08 | **11.32** | **14.84** | **16.85** | **18.63** | **19.56** | **20.21** | **20.68** | **21.02** | **21.28** | **21.48** | **21.65** | **21.78** | **21.90** | **21.99** | **22.06** | **22.12** | **22.17** | **22.22** | **22.27** | **22.32** | **22.35** | **22.38** | **22.41** | **22.43** | **22.44** |
| 2007 | 0.02 | 0.81 | 3.54 | 7.51 | **10.31** | **15.24** | **18.03** | **20.53** | **21.86** | **22.79** | **23.45** | **23.95** | **24.31** | **24.59** | **24.82** | **25.00** | **25.14** | **25.25** | **25.35** | **25.42** | **25.49** | **25.54** | **25.61** | **25.66** | **25.70** | **25.74** | **25.77** | **25.79** | **25.81** | **25.83** |
| 2008 | 0.01 | 0.66 | 3.11 | **5.60** | **10.26** | **13.03** | **15.52** | **16.86** | **17.81** | **18.48** | **18.97** | **19.33** | **19.61** | **19.82** | **20.00** | **20.13** | **20.24** | **20.33** | **20.40** | **20.46** | **20.52** | **20.57** | **20.62** | **20.67** | **20.70** | **20.73** | **20.75** | **20.77** | **20.79** | **20.80** |
| 2009 | 0.01 | 0.41 | **1.34** | **3.69** | **5.56** | **7.31** | **8.29** | **9.00** | **9.51** | **9.89** | **10.18** | **10.40** | **10.58** | **10.72** | **10.83** | **10.92** | **11.00** | **11.06** | **11.12** | **11.17** | **11.23** | **11.27** | **11.31** | **11.34** | **11.37** | **11.39** | **11.41** | **11.42** | **11.44** | **11.45** |
| 2010 | 0.00 | **0.19** | **1.25** | **2.56** | **3.98** | **4.78** | **5.38** | **5.84** | **6.20** | **6.47** | **6.69** | **6.86** | **7.00** | **7.12** | **7.22** | **7.30** | **7.37** | **7.43** | **7.49** | **7.54** | **7.59** | **7.64** | **7.67** | **7.70** | **7.72** | **7.75** | **7.76** | **7.78** | **7.79** | **7.80** |
| 2011 | **0.01** | **0.37** | **1.16** | **2.26** | **2.97** | **3.52** | **3.95** | **4.30** | **4.57** | **4.80** | **4.99** | **5.14** | **5.27** | **5.38** | **5.48** | **5.55** | **5.62** | **5.68** | **5.74** | **5.80** | **5.85** | **5.88** | **5.92** | **5.94** | **5.96** | **5.98** | **6.00** | **6.01** | **6.02** | **6.03** |
| 2012 | **0.02** | **0.31** | **1.16** | **1.94** | **2.65** | **3.23** | **3.71** | **4.09** | **4.41** | **4.66** | **4.87** | **5.05** | **5.19** | **5.30** | **5.39** | **5.47** | **5.55** | **5.62** | **5.68** | **5.73** | **5.77** | **5.80** | **5.83** | **5.85** | **5.87** | **5.89** | **5.90** | **5.91** | **5.92** | **5.92** |
| 2013 | **0.01** | **0.37** | **1.11** | **2.04** | **2.91** | **3.63** | **4.21** | **4.69** | **5.08** | **5.39** | **5.63** | **5.83** | **5.99** | **6.11** | **6.21** | **6.31** | **6.40** | **6.48** | **6.54** | **6.59** | **6.63** | **6.67** | **6.69** | **6.71** | **6.73** | **6.75** | **6.76** | **6.77** | **6.78** | **6.78** |
| 2014 | **0.01** | **0.30** | **1.06** | **2.03** | **2.98** | **3.77** | **4.44** | **4.99** | **5.44** | **5.80** | **6.08** | **6.30** | **6.48** | **6.62** | **6.76** | **6.89** | **7.00** | **7.09** | **7.16** | **7.22** | **7.27** | **7.31** | **7.35** | **7.37** | **7.40** | **7.41** | **7.43** | **7.44** | **7.45** | **7.46** |
| 2015 | **0.01** | **0.33** | **1.16** | **2.23** | **3.29** | **4.21** | **4.98** | **5.63** | **6.14** | **6.55** | **6.87** | **7.12** | **7.33** | **7.52** | **7.70** | **7.86** | **7.99** | **8.09** | **8.18** | **8.25** | **8.30** | **8.35** | **8.39** | **8.42** | **8.44** | **8.46** | **8.48** | **8.49** | **8.51** | **8.51** |
| 2016 | **0.01** | **0.33** | **1.20** | **2.34** | **3.48** | **4.47** | **5.30** | **5.97** | **6.51** | **6.93** | **7.25** | **7.50** | **7.74** | **7.96** | **8.15** | **8.30** | **8.43** | **8.53** | **8.61** | **8.68** | **8.73** | **8.78** | **8.81** | **8.84** | **8.87** | **8.89** | **8.90** | **8.92** | **8.93** | **8.94** |
| 2017 | **0.02** | **0.35** | **1.27** | **2.50** | **3.72** | **4.76** | **5.62** | **6.31** | **6.85** | **7.27** | **7.58** | **7.87** | **8.15** | **8.38** | **8.56** | **8.72** | **8.84** | **8.94** | **9.02** | **9.09** | **9.14** | **9.18** | **9.22** | **9.25** | **9.27** | **9.29** | **9.31** | **9.32** | **9.33** | **9.34** |
| 2018 | **0.02** | **0.36** | **1.29** | **2.54** | **3.78** | **4.83** | **5.70** | **6.39** | **6.92** | **7.33** | **7.70** | **8.04** | **8.32** | **8.54** | **8.73** | **8.87** | **8.99** | **9.09** | **9.17** | **9.23** | **9.29** | **9.33** | **9.36** | **9.39** | **9.42** | **9.43** | **9.45** | **9.46** | **9.47** | **9.48** |

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1982 | 0.41 | 20.12 | 28.20 | 37.90 | 55.97 | 66.07 | 68.99 | 70.57 | 71.65 | 72.51 | 73.44 | 74.28 | 75.04 | 75.35 | 75.66 | 75.93 | 76.25 | 76.67 | 76.82 | 77.00 | 77.22 | 77.31 | 77.40 | 77.46 | 77.55 | 77.70 | 77.72 | 77.73 | 77.76 | **77.81** |
| 1983 | 0.36 | 1.19 | 3.29 | 21.54 | 43.68 | 49.92 | 53.83 | 57.83 | 61.96 | 67.54 | 71.78 | 75.05 | 76.02 | 77.01 | 77.75 | 78.53 | 79.40 | 79.76 | 80.06 | 80.41 | 80.77 | 80.99 | 81.14 | 81.25 | 81.34 | 81.46 | 81.51 | 81.56 | **81.61** | **81.69** |
| 1984 | 0.26 | 1.75 | 22.60 | 44.20 | 50.82 | 55.04 | 58.82 | 62.14 | 66.32 | 69.83 | 72.71 | 73.60 | 74.49 | 75.17 | 75.87 | 76.54 | 76.87 | 77.14 | 77.44 | 77.75 | 78.01 | 78.16 | 78.38 | 78.45 | 78.56 | 78.74 | 78.79 | **78.84** | **78.92** | **78.99** |
| 1985 | 0.35 | 12.58 | 34.91 | 42.30 | 47.22 | 52.37 | 57.50 | 64.63 | 70.08 | 73.86 | 74.86 | 75.90 | 76.67 | 77.51 | 78.28 | 78.65 | 78.97 | 79.31 | 79.63 | 79.88 | 80.08 | 80.36 | 80.44 | 80.52 | 80.71 | 80.79 | **80.83** | **80.91** | **80.97** | **81.02** |
| 1986 | 0.58 | 4.59 | 7.31 | 10.41 | 14.55 | 19.26 | 30.66 | 47.97 | 59.54 | 61.93 | 65.24 | 67.64 | 71.15 | 74.32 | 75.66 | 77.10 | 78.82 | 80.42 | 81.44 | 82.06 | 82.80 | 83.07 | 83.27 | 83.51 | 83.65 | **83.76** | **83.87** | **83.98** | **84.05** | **84.11** |
| 1987 | 0.24 | 1.18 | 2.96 | 5.85 | 9.16 | 17.20 | 33.70 | 47.25 | 50.42 | 54.95 | 58.39 | 63.79 | 69.12 | 71.36 | 73.97 | 77.18 | 80.45 | 82.32 | 83.44 | 84.55 | 85.05 | 85.39 | 85.73 | 85.98 | **86.13** | **86.29** | **86.41** | **86.51** | **86.59** | **86.66** |
| 1988 | 0.29 | 1.61 | 4.74 | 9.37 | 23.27 | 44.83 | 58.80 | 61.65 | 65.53 | 68.27 | 72.06 | 75.63 | 77.21 | 78.84 | 80.76 | 82.53 | 83.73 | 84.45 | 85.26 | 85.58 | 85.83 | 86.02 | 86.15 | **86.26** | **86.40** | **86.52** | **86.60** | **86.67** | **86.72** | **86.77** |
| 1989 | 0.31 | 2.16 | 6.43 | 21.96 | 46.18 | 61.14 | 63.97 | 67.77 | 70.39 | 74.10 | 77.55 | 79.05 | 80.65 | 82.55 | 84.27 | 85.43 | 86.14 | 86.88 | 87.15 | 87.34 | 87.53 | 87.64 | **87.73** | **87.87** | **87.98** | **88.06** | **88.12** | **88.18** | **88.22** | **88.26** |
| 1990 | 0.25 | 1.88 | 12.03 | 41.24 | 59.45 | 62.53 | 66.78 | 69.63 | 73.82 | 77.73 | 79.34 | 81.13 | 83.34 | 85.33 | 86.60 | 87.35 | 88.22 | 88.51 | 88.70 | 88.89 | 89.03 | **89.12** | **89.26** | **89.36** | **89.44** | **89.50** | **89.55** | **89.60** | **89.63** | **89.67** |
| 1991 | 0.28 | 5.43 | 33.30 | 55.01 | 58.34 | 63.37 | 66.71 | 71.93 | 76.65 | 78.44 | 80.60 | 83.26 | 85.74 | 87.23 | 88.07 | 88.91 | 89.23 | 89.43 | 89.63 | 89.75 | **89.85** | **90.00** | **90.11** | **90.19** | **90.26** | **90.31** | **90.36** | **90.40** | **90.44** | **90.47** |
| 1992 | 0.36 | 8.47 | 25.29 | 29.81 | 37.21 | 42.84 | 52.83 | 62.60 | 66.01 | 70.64 | 76.43 | 82.23 | 85.22 | 86.80 | 87.80 | 88.40 | 88.79 | 89.08 | 89.31 | **89.48** | **89.70** | **89.82** | **89.94** | **90.04** | **90.13** | **90.20** | **90.26** | **90.31** | **90.36** | **90.40** |
| 1993 | 0.63 | 4.76 | 8.33 | 14.78 | 20.87 | 31.10 | 42.84 | 48.21 | 55.55 | 65.37 | 77.09 | 82.31 | 85.00 | 86.49 | 87.40 | 87.99 | 88.45 | 88.81 | **89.06** | **89.37** | **89.50** | **89.63** | **89.76** | **89.86** | **89.93** | **90.02** | **90.09** | **90.15** | **90.21** | **90.26** |
| 1994 | 0.27 | 2.19 | 8.21 | 13.88 | 24.23 | 35.59 | 41.16 | 49.01 | 59.27 | 72.65 | 78.91 | 82.31 | 84.23 | 85.39 | 86.15 | 86.70 | 87.14 | **87.48** | **87.86** | **88.03** | **88.18** | **88.33** | **88.44** | **88.53** | **88.62** | **88.70** | **88.77** | **88.84** | **88.89** | **88.94** |
| 1995 | 2.01 | 11.30 | 17.80 | 32.35 | 45.43 | 50.25 | 57.47 | 66.43 | 75.83 | 80.74 | 83.50 | 85.11 | 86.05 | 86.58 | 86.92 | 87.20 | **87.43** | **87.78** | **87.96** | **88.13** | **88.27** | **88.38** | **88.48** | **88.57** | **88.64** | **88.71** | **88.78** | **88.83** | **88.88** | **88.92** |
| 1996 | 0.38 | 3.13 | 15.39 | 29.84 | 35.62 | 45.15 | 57.43 | 71.08 | 77.78 | 81.54 | 83.64 | 84.85 | 85.55 | 86.02 | 86.36 | **86.66** | **87.07** | **87.26** | **87.44** | **87.60** | **87.73** | **87.83** | **87.93** | **88.02** | **88.10** | **88.17** | **88.23** | **88.29** | **88.33** | **88.38** |
| 1997 | 0.71 | 11.85 | 28.22 | 33.83 | 44.12 | 57.29 | 71.23 | 78.13 | 81.96 | 84.07 | 85.26 | 85.98 | 86.44 | 86.77 | **87.07** | **87.53** | **87.75** | **87.97** | **88.14** | **88.29** | **88.40** | **88.51** | **88.61** | **88.69** | **88.77** | **88.84** | **88.89** | **88.95** | **88.99** | **89.03** |
| 1998 | 0.99 | 7.17 | 12.59 | 24.00 | 40.60 | 63.03 | 73.47 | 79.09 | 82.07 | 83.76 | 84.76 | 85.48 | 85.99 | **86.44** | **87.02** | **87.27** | **87.50** | **87.70** | **87.86** | **87.99** | **88.11** | **88.23** | **88.34** | **88.43** | **88.52** | **88.59** | **88.65** | **88.71** | **88.75** | **88.80** |
| 1999 | 0.52 | 3.31 | 15.01 | 33.57 | 58.55 | 70.43 | 76.98 | 80.37 | 82.29 | 83.42 | 84.27 | 84.86 | **85.40** | **86.04** | **86.32** | **86.58** | **86.79** | **86.96** | **87.10** | **87.24** | **87.36** | **87.47** | **87.58** | **87.66** | **87.74** | **87.81** | **87.87** | **87.92** | **87.97** | **88.01** |
| 2000 | 0.88 | 29.50 | 54.85 | 71.85 | 79.42 | 83.48 | 85.53 | 86.66 | 87.27 | 87.67 | 87.93 | **88.18** | **88.61** | **88.84** | **89.06** | **89.23** | **89.36** | **89.48** | **89.58** | **89.66** | **89.74** | **89.81** | **89.87** | **89.92** | **89.97** | **90.00** | **90.04** | **90.07** | **90.09** | **90.12** |
| 2001 | 5.42 | 24.22 | 58.38 | 71.73 | 78.39 | 81.68 | 83.42 | 84.46 | 85.30 | 85.81 | **86.27** | **86.89** | **87.18** | **87.45** | **87.69** | **87.88** | **88.03** | **88.18** | **88.32** | **88.44** | **88.55** | **88.64** | **88.72** | **88.79** | **88.86** | **88.91** | **88.95** | **89.00** | **89.04** | **89.08** |
| 2002 | 3.06 | 38.12 | 57.99 | 68.59 | 73.66 | 76.52 | 78.29 | 79.88 | 80.89 | **81.76** | **82.65** | **83.08** | **83.46** | **83.79** | **84.08** | **84.31** | **84.53** | **84.73** | **84.92** | **85.09** | **85.24** | **85.36** | **85.48** | **85.57** | **85.66** | **85.73** | **85.80** | **85.87** | **85.93** | **85.98** |
| 2003 | 6.38 | 24.58 | 42.50 | 51.62 | 56.96 | 60.13 | 63.15 | 65.35 | **67.41** | **68.78** | **69.72** | **70.40** | **70.93** | **71.41** | **71.83** | **72.20** | **72.53** | **72.84** | **73.12** | **73.37** | **73.58** | **73.77** | **73.94** | **74.08** | **74.21** | **74.33** | **74.45** | **74.55** | **74.64** | **74.73** |
| 2004 | 5.91 | 24.51 | 35.83 | 42.54 | 46.35 | 50.08 | 52.84 | **55.40** | **57.18** | **58.50** | **59.43** | **60.17** | **60.86** | **61.48** | **62.02** | **62.50** | **62.93** | **63.33** | **63.67** | **63.98** | **64.24** | **64.48** | **64.68** | **64.86** | **65.03** | **65.20** | **65.34** | **65.47** | **65.59** | **65.68** |
| 2005 | 6.33 | 15.51 | 23.10 | 27.91 | 32.98 | 36.59 | **39.30** | **40.77** | **41.86** | **42.65** | **43.32** | **43.96** | **44.57** | **45.13** | **45.63** | **46.10** | **46.52** | **46.91** | **47.24** | **47.54** | **47.80** | **48.03** | **48.23** | **48.43** | **48.62** | **48.79** | **48.93** | **49.07** | **49.18** | **49.28** |
| 2006 | 1.16 | 8.40 | 16.53 | 26.62 | 31.85 | **34.95** | **36.36** | **37.31** | **38.02** | **38.64** | **39.25** | **39.83** | **40.41** | **40.96** | **41.51** | **42.03** | **42.51** | **42.92** | **43.29** | **43.62** | **43.91** | **44.16** | **44.40** | **44.63** | **44.84** | **45.02** | **45.19** | **45.33** | **45.46** | **45.57** |
| 2007 | 1.27 | 12.08 | 25.87 | 31.59 | **34.53** | **35.92** | **36.78** | **37.43** | **37.99** | **38.55** | **39.08** | **39.62** | **40.16** | **40.70** | **41.25** | **41.75** | **42.20** | **42.60** | **42.96** | **43.26** | **43.53** | **43.79** | **44.04** | **44.25** | **44.45** | **44.62** | **44.77** | **44.91** | **45.02** | **45.12** |
| 2008 | 2.04 | 24.00 | 33.60 | **37.98** | **39.62** | **40.70** | **41.45** | **42.08** | **42.71** | **43.31** | **43.92** | **44.52** | **45.12** | **45.72** | **46.27** | **46.77** | **47.23** | **47.63** | **47.98** | **48.28** | **48.57** | **48.86** | **49.10** | **49.32** | **49.52** | **49.69** | **49.84** | **49.97** | **50.09** | **50.18** |
| 2009 | 6.98 | 15.62 | **21.55** | **24.75** | **27.08** | **28.67** | **30.06** | **31.47** | **32.86** | **34.20** | **35.47** | **36.66** | **37.76** | **38.76** | **39.65** | **40.43** | **41.12** | **41.73** | **42.26** | **42.78** | **43.29** | **43.73** | **44.13** | **44.47** | **44.79** | **45.06** | **45.30** | **45.52** | **45.71** | **45.88** |
| 2010 | 1.70 | **6.22** | **10.64** | **14.37** | **16.89** | **19.10** | **21.33** | **23.50** | **25.53** | **27.39** | **29.09** | **30.63** | **31.99** | **33.20** | **34.26** | **35.19** | **36.00** | **36.72** | **37.43** | **38.11** | **38.71** | **39.24** | **39.71** | **40.13** | **40.50** | **40.83** | **41.13** | **41.39** | **41.62** | **41.83** |
| 2011 | **1.59** | **7.25** | **12.05** | **15.87** | **18.89** | **21.81** | **24.52** | **26.98** | **29.22** | **31.30** | **33.20** | **34.92** | **36.39** | **37.67** | **38.78** | **39.74** | **40.59** | **41.40** | **42.18** | **42.86** | **43.46** | **43.98** | **44.44** | **44.85** | **45.22** | **45.54** | **45.82** | **46.07** | **46.29** | **46.49** |
| 2012 | **3.66** | **10.98** | **19.82** | **27.57** | **33.61** | **38.49** | **42.70** | **46.36** | **49.57** | **52.39** | **54.71** | **56.64** | **58.25** | **59.60** | **60.72** | **61.68** | **62.59** | **63.44** | **64.16** | **64.78** | **65.32** | **65.77** | **66.17** | **66.52** | **66.83** | **67.09** | **67.33** | **67.53** | **67.70** | **67.86** |
| 2013 | **3.28** | **15.47** | **27.34** | **37.05** | **44.11** | **50.12** | **55.22** | **59.68** | **63.42** | **66.44** | **68.88** | **70.84** | **72.46** | **73.79** | **74.89** | **75.89** | **76.81** | **77.58** | **78.23** | **78.78** | **79.26** | **79.66** | **80.01** | **80.31** | **80.57** | **80.79** | **80.97** | **81.13** | **81.27** | **81.39** |
| 2014 | **2.71** | **12.06** | **21.39** | **29.34** | **35.83** | **41.44** | **46.52** | **51.01** | **54.88** | **58.06** | **60.69** | **62.83** | **64.54** | **65.93** | **67.21** | **68.38** | **69.37** | **70.21** | **70.92** | **71.53** | **72.04** | **72.47** | **72.85** | **73.18** | **73.46** | **73.70** | **73.91** | **74.09** | **74.24** | **74.38** |
| 2015 | **2.60** | **10.93** | **19.22** | **26.99** | **33.26** | **38.72** | **43.66** | **47.92** | **51.41** | **54.32** | **56.75** | **58.73** | **60.37** | **61.89** | **63.27** | **64.43** | **65.41** | **66.25** | **66.96** | **67.55** | **68.05** | **68.49** | **68.86** | **69.19** | **69.47** | **69.71** | **69.92** | **70.09** | **70.25** | **70.39** |
| 2016 | **2.62** | **10.84** | **19.49** | **27.44** | **34.00** | **39.83** | **44.74** | **48.78** | **52.17** | **55.05** | **57.45** | **59.44** | **61.26** | **62.89** | **64.23** | **65.34** | **66.26** | **67.03** | **67.69** | **68.25** | **68.74** | **69.16** | **69.52** | **69.83** | **70.09** | **70.32** | **70.51** | **70.67** | **70.82** | **70.96** |
| 2017 | **2.48** | **10.77** | **19.50** | **27.70** | **34.49** | **40.17** | **44.93** | **48.80** | **52.04** | **54.84** | **57.19** | **59.36** | **61.30** | **62.91** | **64.25** | **65.37** | **66.28** | **67.05** | **67.71** | **68.28** | **68.77** | **69.17** | **69.53** | **69.83** | **70.09** | **70.31** | **70.50** | **70.67** | **70.82** | **70.96** |
| 2018 | **2.48** | **10.70** | **19.35** | **27.52** | **33.95** | **39.22** | **43.70** | **47.37** | **50.52** | **53.26** | **55.80** | **58.11** | **60.01** | **61.57** | **62.89** | **64.00** | **64.90** | **65.66** | **66.31** | **66.87** | **67.35** | **67.74** | **68.09** | **68.39** | **68.64** | **68.87** | **69.08** | **69.25** | **69.41** | **69.55** |

**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 | 0.18 | 0.68 | 0.97 | 0.99 | 1.05 | 0.91 | 0.99 | 0.80 | 0.48 | 0.30 | 0.31 | 0.38 | 0.20 | 0.45 | 0.18 | 0.03 | 0.37 | 0.03 | **0.19** | **0.26** | **0.12** | **0.16** | **0.12** | **0.09** | **0.07** | **0.06** | **0.05** | **0.04** | **0.03** |
| 1993 | 0.00 | 0.20 | 0.71 | 1.11 | 1.59 | 1.47 | 1.19 | 0.90 | 0.49 | 0.35 | 0.30 | 0.30 | 0.22 | 0.11 | 0.12 | 0.15 | 0.17 | 0.26 | **0.22** | **0.24** | **0.13** | **0.16** | **0.11** | **0.08** | **0.07** | **0.05** | **0.04** | **0.04** | **0.03** | **0.02** |
| 1994 | 0.01 | 0.32 | 0.79 | 1.15 | 1.30 | 1.08 | 0.81 | 0.53 | 0.39 | 0.33 | 0.30 | 0.29 | 0.19 | 0.17 | 0.14 | 0.16 | 0.41 | **0.21** | **0.28** | **0.16** | **0.19** | **0.13** | **0.10** | **0.07** | **0.06** | **0.05** | **0.04** | **0.03** | **0.03** | **0.02** |
| 1995 | 0.02 | 0.41 | 1.37 | 2.06 | 1.88 | 1.85 | 1.24 | 0.86 | 0.89 | 0.91 | 0.71 | 0.80 | 0.75 | 0.09 | 0.15 | 0.73 | **0.67** | **0.53** | **0.24** | **0.31** | **0.24** | **0.18** | **0.15** | **0.13** | **0.11** | **0.09** | **0.07** | **0.06** | **0.05** | **0.03** |
| 1996 | 0.01 | 0.47 | 1.45 | 1.83 | 1.61 | 0.93 | 0.68 | 0.72 | 0.76 | 0.59 | 0.74 | 0.41 | 0.47 | 0.39 | 0.94 | **0.27** | **0.59** | **0.33** | **0.36** | **0.21** | **0.14** | **0.11** | **0.09** | **0.07** | **0.05** | **0.04** | **0.04** | **0.03** | **0.02** | **0.02** |
| 1997 | 0.02 | 0.62 | 1.68 | 2.20 | 1.46 | 1.04 | 1.07 | 1.03 | 0.92 | 0.72 | 0.71 | 0.62 | 0.88 | 0.92 | **0.63** | **0.70** | **0.56** | **0.67** | **0.42** | **0.28** | **0.22** | **0.17** | **0.14** | **0.11** | **0.09** | **0.07** | **0.06** | **0.04** | **0.03** | **0.03** |
| 1998 | 0.00 | 0.21 | 0.75 | 0.79 | 0.73 | 0.83 | 1.16 | 0.97 | 0.75 | 0.64 | 0.62 | 0.83 | 1.08 | **0.78** | **0.87** | **0.59** | **0.59** | **0.35** | **0.24** | **0.18** | **0.14** | **0.11** | **0.09** | **0.07** | **0.06** | **0.05** | **0.04** | **0.03** | **0.02** | **0.02** |
| 1999 | 0.01 | 0.25 | 0.50 | 0.68 | 0.87 | 0.99 | 0.97 | 0.77 | 0.57 | 0.71 | 0.75 | 0.89 | **0.67** | **0.95** | **0.66** | **0.59** | **0.35** | **0.23** | **0.17** | **0.14** | **0.11** | **0.09** | **0.07** | **0.06** | **0.05** | **0.04** | **0.03** | **0.02** | **0.02** | **0.01** |
| 2000 | 0.02 | 0.36 | 1.19 | 1.99 | 3.15 | 2.83 | 1.74 | 1.63 | 1.94 | 1.10 | 1.37 | **1.00** | **1.91** | **1.28** | **1.56** | **1.04** | **0.70** | **0.55** | **0.44** | **0.35** | **0.28** | **0.23** | **0.19** | **0.15** | **0.12** | **0.09** | **0.07** | **0.06** | **0.05** | **0.05** |
| 2001 | 0.00 | 0.20 | 1.28 | 2.71 | 2.91 | 2.87 | 2.34 | 2.42 | 2.50 | 3.38 | **2.35** | **2.77** | **1.97** | **1.61** | **0.84** | **0.53** | **0.37** | **0.28** | **0.22** | **0.18** | **0.15** | **0.12** | **0.10** | **0.08** | **0.06** | **0.05** | **0.04** | **0.03** | **0.03** | **0.03** |
| 2002 | 0.01 | 0.43 | 1.75 | 2.24 | 2.04 | 1.76 | 1.80 | 1.93 | 2.43 | **1.78** | **2.62** | **1.92** | **1.46** | **0.78** | **0.48** | **0.34** | **0.26** | **0.21** | **0.17** | **0.14** | **0.12** | **0.09** | **0.07** | **0.06** | **0.04** | **0.03** | **0.03** | **0.03** | **0.03** | **0.02** |
| 2003 | 0.01 | 0.56 | 1.26 | 1.32 | 1.29 | 1.43 | 1.62 | 2.19 | **1.69** | **2.91** | **1.82** | **1.45** | **0.78** | **0.46** | **0.32** | **0.24** | **0.19** | **0.15** | **0.12** | **0.10** | **0.08** | **0.06** | **0.05** | **0.04** | **0.03** | **0.03** | **0.03** | **0.02** | **0.02** | **0.01** |
| 2004 | 0.14 | 0.86 | 1.18 | 1.26 | 1.47 | 1.66 | 2.27 | **1.88** | **3.25** | **2.06** | **1.76** | **0.97** | **0.57** | **0.40** | **0.31** | **0.24** | **0.19** | **0.15** | **0.12** | **0.09** | **0.07** | **0.06** | **0.05** | **0.04** | **0.03** | **0.04** | **0.03** | **0.02** | **0.02** | **0.01** |
| 2005 | 0.11 | 0.66 | 1.61 | 2.13 | 2.53 | 3.30 | **2.48** | **4.18** | **2.67** | **2.36** | **1.29** | **0.71** | **0.45** | **0.32** | **0.23** | **0.18** | **0.14** | **0.11** | **0.09** | **0.07** | **0.05** | **0.04** | **0.03** | **0.03** | **0.03** | **0.03** | **0.02** | **0.02** | **0.01** | **0.01** |
| 2006 | 0.06 | 1.05 | 2.30 | 3.35 | 4.51 | **3.18** | **5.87** | **4.15** | **3.69** | **2.11** | **1.19** | **0.71** | **0.47** | **0.33** | **0.24** | **0.19** | **0.15** | **0.11** | **0.09** | **0.07** | **0.05** | **0.04** | **0.03** | **0.04** | **0.03** | **0.02** | **0.02** | **0.02** | **0.01** | **0.01** |
| 2007 | 0.05 | 1.12 | 4.17 | 6.29 | **5.10** | **10.55** | **7.82** | **7.16** | **4.31** | **2.50** | **1.51** | **0.94** | **0.61** | **0.42** | **0.31** | **0.23** | **0.17** | **0.13** | **0.10** | **0.07** | **0.06** | **0.05** | **0.05** | **0.04** | **0.03** | **0.03** | **0.02** | **0.02** | **0.01** | **0.01** |
| 2008 | 0.02 | 1.33 | 5.18 | **4.78** | **11.09** | **8.32** | **8.09** | **5.06** | **3.02** | **1.86** | **1.17** | **0.74** | **0.48** | **0.33** | **0.23** | **0.17** | **0.12** | **0.09** | **0.07** | **0.05** | **0.04** | **0.05** | **0.04** | **0.03** | **0.02** | **0.02** | **0.01** | **0.01** | **0.01** | **0.01** |
| 2009 | 0.02 | 0.75 | **2.00** | **4.99** | **5.01** | **5.49** | **3.63** | **2.30** | **1.49** | **0.97** | **0.63** | **0.42** | **0.29** | **0.20** | **0.14** | **0.10** | **0.08** | **0.06** | **0.04** | **0.04** | **0.04** | **0.03** | **0.03** | **0.02** | **0.02** | **0.01** | **0.01** | **0.01** | **0.01** | **0.00** |
| 2010 | 0.03 | **0.56** | **2.53** | **3.19** | **4.23** | **2.96** | **1.97** | **1.35** | **0.92** | **0.63** | **0.43** | **0.30** | **0.21** | **0.15** | **0.11** | **0.08** | **0.06** | **0.05** | **0.04** | **0.04** | **0.04** | **0.03** | **0.02** | **0.02** | **0.01** | **0.01** | **0.01** | **0.01** | **0.00** | **0.00** |
| 2011 | **0.02** | **0.81** | **1.90** | **2.79** | **2.29** | **1.58** | **1.12** | **0.80** | **0.57** | **0.41** | **0.30** | **0.22** | **0.16** | **0.12** | **0.09** | **0.07** | **0.06** | **0.05** | **0.05** | **0.04** | **0.03** | **0.03** | **0.02** | **0.02** | **0.01** | **0.01** | **0.01** | **0.01** | **0.00** | **0.00** |
| 2012 | **0.04** | **0.72** | **1.91** | **1.86** | **1.59** | **1.23** | **0.95** | **0.73** | **0.56** | **0.44** | **0.33** | **0.25** | **0.19** | **0.14** | **0.11** | **0.09** | **0.07** | **0.08** | **0.06** | **0.05** | **0.04** | **0.03** | **0.02** | **0.02** | **0.01** | **0.01** | **0.01** | **0.01** | **0.00** | **0.00** |
| 2013 | **0.02** | **0.54** | **1.22** | **1.40** | **1.50** | **1.36** | **1.19** | **1.04** | **0.90** | **0.76** | **0.63** | **0.51** | **0.41** | **0.33** | **0.26** | **0.22** | **0.22** | **0.19** | **0.15** | **0.12** | **0.09** | **0.07** | **0.06** | **0.04** | **0.03** | **0.03** | **0.02** | **0.02** | **0.01** | **0.01** |
| 2014 | **0.00** | **0.19** | **0.69** | **1.00** | **1.20** | **1.16** | **1.07** | **0.94** | **0.83** | **0.70** | **0.58** | **0.47** | **0.38** | **0.30** | **0.25** | **0.25** | **0.22** | **0.18** | **0.14** | **0.11** | **0.09** | **0.07** | **0.05** | **0.04** | **0.03** | **0.02** | **0.02** | **0.01** | **0.01** | **0.01** |
| 2015 | **0.01** | **0.20** | **0.65** | **0.91** | **1.07** | **1.04** | **0.94** | **0.83** | **0.71** | **0.59** | **0.47** | **0.38** | **0.30** | **0.25** | **0.25** | **0.22** | **0.18** | **0.14** | **0.11** | **0.09** | **0.07** | **0.05** | **0.04** | **0.03** | **0.02** | **0.02** | **0.01** | **0.01** | **0.01** | **0.01** |
| 2016 | **0.01** | **0.22** | **0.67** | **0.96** | **1.14** | **1.10** | **1.01** | **0.87** | **0.72** | **0.58** | **0.46** | **0.37** | **0.31** | **0.30** | **0.26** | **0.22** | **0.18** | **0.14** | **0.11** | **0.08** | **0.06** | **0.05** | **0.04** | **0.03** | **0.02** | **0.02** | **0.01** | **0.01** | **0.01** | **0.01** |
| 2017 | **0.01** | **0.23** | **0.74** | **1.07** | **1.27** | **1.23** | **1.11** | **0.94** | **0.76** | **0.60** | **0.48** | **0.39** | **0.38** | **0.34** | **0.28** | **0.23** | **0.18** | **0.14** | **0.11** | **0.09** | **0.07** | **0.05** | **0.04** | **0.03** | **0.02** | **0.02** | **0.01** | **0.01** | **0.01** | **0.01** |
| 2018 | **0.01** | **0.24** | **0.79** | **1.13** | **1.35** | **1.29** | **1.14** | **0.96** | **0.76** | **0.59** | **0.48** | **0.45** | **0.41** | **0.34** | **0.28** | **0.22** | **0.18** | **0.14** | **0.11** | **0.08** | **0.06** | **0.05** | **0.04** | **0.03** | **0.02** | **0.02** | **0.01** | **0.01** | **0.01** | **0.01** |

**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 | 2.25 | 23.79 | 29.72 | 7.64 | 13.02 | 10.61 | 20.99 | 25.97 | 11.97 | 16.51 | 28.69 | 38.59 | 24.86 | 16.99 | 14.63 | 8.64 | 7.48 | 5.61 | 7.10 | **5.00** | **6.32** | **5.62** | **3.77** | **3.08** | **2.67** | **2.30** | **1.97** | **1.61** | **1.34** | **1.07** |
| 1993 | 2.80 | 11.29 | 5.38 | 8.58 | 7.93 | 15.05 | 20.25 | 10.64 | 16.63 | 28.03 | 44.85 | 30.95 | 21.26 | 17.75 | 10.32 | 8.38 | 7.94 | 8.17 | **5.30** | **7.87** | **5.08** | **3.67** | **3.26** | **2.77** | **2.32** | **2.18** | **1.87** | **1.60** | **1.42** | **1.12** |
| 1994 | 1.77 | 4.05 | 6.83 | 6.95 | 11.19 | 15.35 | 9.44 | 14.03 | 22.20 | 40.60 | 29.76 | 21.32 | 15.79 | 10.84 | 8.72 | 8.04 | 7.63 | **5.80** | **8.26** | **4.62** | **3.23** | **3.00** | **2.51** | **2.07** | **2.04** | **1.76** | **1.51** | **1.38** | **1.15** | **0.86** |
| 1995 | 2.06 | 15.49 | 9.25 | 22.05 | 24.21 | 10.79 | 19.06 | 28.41 | 39.74 | 30.80 | 24.07 | 16.67 | 12.91 | 10.06 | 7.00 | 3.93 | **5.36** | **9.17** | **7.49** | **5.10** | **4.29** | **3.73** | **3.20** | **2.82** | **2.38** | **2.05** | **1.83** | **1.57** | **1.31** | **1.04** |
| 1996 | 2.06 | 5.96 | 17.48 | 22.25 | 10.13 | 18.09 | 29.82 | 45.78 | 35.96 | 27.44 | 19.52 | 13.06 | 9.52 | 7.88 | 7.69 | **5.93** | **10.37** | **6.66** | **4.70** | **4.13** | **3.52** | **2.97** | **2.76** | **2.39** | **2.07** | **1.89** | **1.63** | **1.38** | **1.14** | **0.86** |
| 1997 | 3.22 | 29.07 | 27.36 | 9.84 | 20.11 | 32.50 | 44.82 | 37.58 | 31.60 | 23.80 | 13.72 | 10.71 | 5.68 | 5.27 | **4.11** | **11.13** | **8.03** | **5.67** | **4.84** | **4.16** | **3.55** | **3.21** | **2.78** | **2.41** | **2.16** | **1.87** | **1.60** | **1.36** | **1.12** | **0.86** |
| 1998 | 4.10 | 16.68 | 8.03 | 17.60 | 31.68 | 52.74 | 41.98 | 32.67 | 22.34 | 15.80 | 10.79 | 9.03 | 6.67 | **6.86** | **13.14** | **6.69** | **4.55** | **4.28** | **3.59** | **2.96** | **2.92** | **2.60** | **2.32** | **2.14** | **1.87** | **1.61** | **1.38** | **1.17** | **0.97** | **0.75** |
| 1999 | 2.38 | 5.83 | 13.42 | 24.72 | 47.15 | 38.12 | 30.96 | 21.49 | 14.71 | 10.69 | 9.02 | 6.70 | **7.71** | **12.36** | **6.13** | **3.77** | **3.30** | **2.79** | **2.33** | **2.20** | **1.94** | **1.83** | **1.73** | **1.53** | **1.32** | **1.14** | **0.97** | **0.82** | **0.67** | **0.52** |
| 2000 | 3.43 | 32.80 | 36.23 | 44.31 | 40.48 | 32.22 | 24.17 | 15.49 | 9.01 | 7.22 | 5.49 | **6.28** | **13.48** | **9.91** | **7.03** | **6.12** | **5.29** | **4.52** | **4.06** | **3.54** | **3.10** | **2.80** | **2.44** | **2.11** | **1.81** | **1.56** | **1.33** | **1.12** | **0.94** | **0.75** |
| 2001 | 6.90 | 32.13 | 54.32 | 40.55 | 33.03 | 23.54 | 15.62 | 10.52 | 8.89 | 5.83 | **6.89** | **13.00** | **6.65** | **4.56** | **4.37** | **3.81** | **3.24** | **3.09** | **2.81** | **2.62** | **2.43** | **2.15** | **1.88** | **1.62** | **1.39** | **1.20** | **1.02** | **0.89** | **0.79** | **0.61** |
| 2002 | 8.96 | 47.02 | 36.04 | 29.56 | 20.70 | 14.70 | 9.84 | 9.67 | 6.96 | **8.31** | **13.38** | **6.87** | **4.29** | **3.81** | **3.32** | **2.85** | **2.62** | **2.34** | **2.27** | **2.17** | **1.93** | **1.69** | **1.46** | **1.26** | **1.08** | **0.92** | **0.82** | **0.73** | **0.60** | **0.46** |
| 2003 | 16.00 | 25.38 | 26.35 | 18.46 | 12.74 | 8.62 | 9.93 | 7.55 | **9.71** | **10.85** | **7.01** | **4.09** | **3.26** | **2.92** | **2.56** | **2.25** | **1.96** | **1.80** | **1.63** | **1.43** | **1.24** | **1.07** | **0.93** | **0.80** | **0.68** | **0.61** | **0.56** | **0.47** | **0.39** | **0.29** |
| 2004 | 10.17 | 20.86 | 15.60 | 11.33 | 7.21 | 6.73 | 5.64 | **8.08** | **9.75** | **7.07** | **4.18** | **3.50** | **3.17** | **2.79** | **2.45** | **2.14** | **1.89** | **1.67** | **1.45** | **1.26** | **1.09** | **0.95** | **0.82** | **0.70** | **0.64** | **0.58** | **0.49** | **0.42** | **0.34** | **0.23** |
| 2005 | 9.03 | 12.66 | 10.47 | 6.52 | 6.58 | 5.19 | **5.25** | **5.39** | **3.82** | **2.37** | **2.03** | **1.90** | **1.73** | **1.52** | **1.33** | **1.19** | **1.06** | **0.92** | **0.80** | **0.69** | **0.60** | **0.52** | **0.44** | **0.40** | **0.37** | **0.31** | **0.27** | **0.23** | **0.19** | **0.14** |
| 2006 | 3.74 | 10.93 | 7.73 | 10.08 | 6.14 | **4.95** | **5.03** | **3.46** | **2.24** | **2.05** | **1.98** | **1.88** | **1.73** | **1.55** | **1.44** | **1.33** | **1.18** | **1.03** | **0.89** | **0.77** | **0.67** | **0.57** | **0.52** | **0.47** | **0.41** | **0.35** | **0.30** | **0.26** | **0.21** | **0.16** |
| 2007 | 4.04 | 19.45 | 17.11 | 7.45 | **4.88** | **4.26** | **2.82** | **1.92** | **1.89** | **2.00** | **1.99** | **1.98** | **1.90** | **1.86** | **1.82** | **1.65** | **1.46** | **1.27** | **1.11** | **0.95** | **0.81** | **0.73** | **0.67** | **0.58** | **0.50** | **0.43** | **0.37** | **0.31** | **0.24** | **0.18** |
| 2008 | 4.05 | 25.84 | 8.80 | **5.10** | **3.50** | **2.57** | **1.77** | **1.83** | **1.99** | **2.07** | **2.07** | **2.01** | **1.93** | **1.83** | **1.66** | **1.47** | **1.30** | **1.13** | **0.98** | **0.85** | **0.77** | **0.71** | **0.61** | **0.53** | **0.46** | **0.39** | **0.34** | **0.28** | **0.23** | **0.17** |
| 2009 | 2.84 | 8.08 | **6.56** | **4.07** | **3.40** | **2.36** | **2.47** | **2.67** | **2.83** | **2.95** | **2.88** | **2.68** | **2.45** | **2.22** | **1.99** | **1.76** | **1.54** | **1.34** | **1.17** | **1.07** | **0.98** | **0.85** | **0.74** | **0.64** | **0.55** | **0.48** | **0.41** | **0.35** | **0.29** | **0.22** |
| 2010 | 2.59 | **5.51** | **5.19** | **4.19** | **2.85** | **2.93** | **3.15** | **3.32** | **3.43** | **3.44** | **3.23** | **2.96** | **2.67** | **2.40** | **2.14** | **1.88** | **1.64** | **1.43** | **1.31** | **1.20** | **1.04** | **0.91** | **0.79** | **0.68** | **0.59** | **0.51** | **0.44** | **0.37** | **0.31** | **0.23** |
| 2011 | **1.20** | **6.08** | **5.35** | **3.62** | **3.60** | **3.88** | **4.07** | **4.17** | **4.16** | **4.08** | **3.85** | **3.53** | **3.15** | **2.77** | **2.41** | **2.10** | **1.82** | **1.66** | **1.52** | **1.31** | **1.14** | **0.98** | **0.85** | **0.74** | **0.64** | **0.55** | **0.47** | **0.39** | **0.32** | **0.24** |
| 2012 | **3.19** | **7.51** | **6.50** | **5.98** | **6.16** | **6.14** | **6.07** | **5.99** | **5.97** | **5.76** | **5.26** | **4.67** | **4.05** | **3.49** | **3.00** | **2.60** | **2.36** | **2.13** | **1.83** | **1.58** | **1.36** | **1.17** | **1.01** | **0.88** | **0.76** | **0.65** | **0.55** | **0.46** | **0.37** | **0.27** |
| 2013 | **3.65** | **12.98** | **15.09** | **14.54** | **13.81** | **14.47** | **14.65** | **15.06** | **14.55** | **13.69** | **12.26** | **10.80** | **9.45** | **8.22** | **7.15** | **6.52** | **5.92** | **5.12** | **4.40** | **3.82** | **3.30** | **2.86** | **2.47** | **2.11** | **1.75** | **1.51** | **1.28** | **1.05** | **0.85** | **0.63** |
| 2014 | **1.99** | **15.29** | **17.18** | **15.10** | **14.25** | **14.61** | **14.69** | **14.59** | **13.96** | **13.01** | **11.56** | **10.02** | **8.56** | **7.33** | **6.57** | **5.91** | **5.11** | **4.41** | **3.81** | **3.29** | **2.76** | **2.38** | **2.05** | **1.75** | **1.51** | **1.27** | **1.06** | **0.85** | **0.70** | **0.55** |
| 2015 | **3.09** | **14.03** | **14.56** | **13.24** | **12.82** | **12.94** | **13.18** | **12.84** | **12.09** | **11.10** | **9.71** | **8.15** | **6.98** | **6.22** | **5.62** | **4.84** | **4.18** | **3.61** | **3.09** | **2.62** | **2.21** | **1.88** | **1.61** | **1.38** | **1.17** | **0.97** | **0.82** | **0.68** | **0.56** | **0.44** |
| 2016 | **3.49** | **13.43** | **14.42** | **13.32** | **13.09** | **13.40** | **12.83** | **12.32** | **11.59** | **10.65** | **9.30** | **7.92** | **7.12** | **6.41** | **5.51** | **4.67** | **3.95** | **3.37** | **2.89** | **2.49** | **2.15** | **1.86** | **1.60** | **1.35** | **1.13** | **0.94** | **0.77** | **0.65** | **0.54** | **0.42** |
| 2017 | **3.27** | **13.59** | **14.77** | **14.06** | **13.86** | **13.44** | **12.85** | **12.18** | **11.54** | **10.73** | **9.44** | **8.57** | **7.73** | **6.65** | **5.64** | **4.83** | **4.02** | **3.47** | **3.00** | **2.59** | **2.19** | **1.89** | **1.61** | **1.36** | **1.12** | **0.94** | **0.80** | **0.67** | **0.56** | **0.43** |
| 2018 | **3.03** | **13.15** | **14.42** | **13.89** | **13.39** | **12.84** | **12.21** | **11.37** | **10.83** | **10.08** | **9.35** | **8.47** | **7.26** | **6.19** | **5.33** | **4.58** | **3.87** | **3.34** | **2.86** | **2.40** | **2.03** | **1.72** | **1.46** | **1.23** | **1.05** | **0.90** | **0.77** | **0.65** | **0.55** | **0.42** |

**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 | 0.18 | 0.68 | 1.18 | 1.65 | 2.08 | 2.40 | 2.68 | 2.84 | 2.93 | 2.97 | 3.00 | 3.03 | 3.04 | 3.06 | 3.06 | 3.06 | 3.07 | 3.07 | 3.08 | 3.08 | 3.09 | 3.09 | 3.09 | 3.09 | 3.10 | 3.10 | 3.10 | 3.10 | 3.10 |
| 1993 | 0.00 | 0.20 | 0.81 | 1.71 | 2.87 | 3.83 | 4.49 | 4.88 | 5.06 | 5.17 | 5.24 | 5.28 | 5.30 | 5.30 | 5.31 | 5.32 | 5.33 | 5.34 | 5.34 | 5.35 | 5.36 | 5.36 | 5.37 | 5.37 | 5.37 | 5.37 | 5.37 | 5.37 | 5.37 | 5.37 |
| 1994 | 0.01 | 0.32 | 1.07 | 2.07 | 3.10 | 3.85 | 4.32 | 4.60 | 4.77 | 4.88 | 4.94 | 4.98 | 5.00 | 5.02 | 5.03 | 5.04 | 5.07 | 5.08 | 5.10 | 5.11 | 5.12 | 5.12 | 5.13 | 5.13 | 5.13 | 5.14 | 5.14 | 5.14 | 5.14 | 5.14 |
| 1995 | 0.02 | 0.43 | 1.56 | 3.07 | 4.13 | 4.89 | 5.33 | 5.58 | 5.76 | 5.86 | 5.92 | 5.97 | 6.01 | 6.01 | 6.02 | 6.04 | 6.06 | 6.08 | 6.09 | 6.10 | 6.10 | 6.11 | 6.11 | 6.11 | 6.11 | 6.12 | 6.12 | 6.12 | 6.12 | 6.12 |
| 1996 | 0.01 | 0.47 | 1.80 | 3.16 | 4.07 | 4.54 | 4.81 | 5.01 | 5.13 | 5.18 | 5.23 | 5.25 | 5.27 | 5.29 | 5.33 | 5.34 | 5.35 | 5.36 | 5.37 | 5.38 | 5.38 | 5.39 | 5.39 | 5.39 | 5.39 | 5.39 | 5.39 | 5.39 | 5.39 | 5.39 |
| 1997 | 0.02 | 0.62 | 1.77 | 2.83 | 3.44 | 3.79 | 4.02 | 4.15 | 4.21 | 4.25 | 4.27 | 4.29 | 4.32 | 4.34 | 4.36 | 4.37 | 4.38 | 4.40 | 4.40 | 4.41 | 4.41 | 4.41 | 4.42 | 4.42 | 4.42 | 4.42 | 4.42 | 4.42 | 4.42 | 4.42 |
| 1998 | 0.00 | 0.20 | 0.81 | 1.38 | 1.81 | 2.15 | 2.36 | 2.46 | 2.52 | 2.55 | 2.58 | 2.61 | 2.65 | 2.67 | 2.70 | 2.72 | 2.73 | 2.74 | 2.74 | 2.75 | 2.75 | 2.75 | 2.75 | 2.75 | 2.76 | 2.76 | 2.76 | 2.76 | 2.76 | 2.76 |
| 1999 | 0.01 | 0.26 | 0.72 | 1.26 | 1.77 | 2.07 | 2.25 | 2.35 | 2.40 | 2.46 | 2.52 | 2.57 | 2.61 | 2.67 | 2.70 | 2.72 | 2.74 | 2.75 | 2.76 | 2.76 | 2.76 | 2.77 | 2.77 | 2.77 | 2.77 | 2.78 | 2.78 | 2.78 | 2.78 | 2.78 |
| 2000 | 0.02 | 0.37 | 1.14 | 1.95 | 2.63 | 2.97 | 3.11 | 3.20 | 3.30 | 3.34 | 3.40 | 3.43 | 3.50 | 3.54 | 3.58 | 3.60 | 3.61 | 3.63 | 3.63 | 3.64 | 3.65 | 3.65 | 3.65 | 3.65 | 3.66 | 3.66 | 3.66 | 3.66 | 3.66 | 3.66 |
| 2001 | 0.00 | 0.19 | 1.00 | 1.76 | 2.21 | 2.50 | 2.68 | 2.82 | 2.96 | 3.11 | 3.21 | 3.32 | 3.38 | 3.43 | 3.45 | 3.47 | 3.47 | 3.48 | 3.49 | 3.49 | 3.49 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| 2002 | 0.01 | 0.41 | 1.25 | 1.91 | 2.32 | 2.60 | 2.83 | 3.05 | 3.30 | 3.46 | 3.67 | 3.80 | 3.89 | 3.94 | 3.96 | 3.98 | 3.99 | 4.01 | 4.01 | 4.02 | 4.03 | 4.03 | 4.03 | 4.04 | 4.04 | 4.04 | 4.04 | 4.04 | 4.04 | 4.04 |
| 2003 | 0.01 | 0.49 | 1.27 | 1.87 | 2.33 | 2.77 | 3.22 | 3.76 | 4.14 | 4.69 | 4.99 | 5.20 | 5.32 | 5.38 | 5.42 | 5.45 | 5.47 | 5.49 | 5.51 | 5.52 | 5.53 | 5.54 | 5.54 | 5.54 | 5.55 | 5.55 | 5.55 | 5.56 | 5.56 | 5.56 |
| 2004 | 0.14 | 0.91 | 1.74 | 2.47 | 3.23 | 4.00 | 4.96 | 5.70 | 6.82 | 7.43 | 7.91 | 8.16 | 8.30 | 8.40 | 8.47 | 8.52 | 8.56 | 8.59 | 8.62 | 8.64 | 8.65 | 8.66 | 8.67 | 8.68 | 8.69 | 8.69 | 8.70 | 8.70 | 8.71 | 8.71 |
| 2005 | 0.11 | 0.72 | 2.00 | 3.47 | 5.07 | 6.97 | 8.27 | 10.30 | 11.47 | 12.44 | 12.94 | 13.21 | 13.37 | 13.49 | 13.57 | 13.63 | 13.68 | 13.72 | 13.75 | 13.77 | 13.79 | 13.80 | 13.81 | 13.82 | 13.83 | 13.83 | 13.84 | 13.85 | 13.85 | 13.85 |
| 2006 | 0.06 | 1.08 | 3.03 | 5.59 | 8.57 | 10.44 | 13.63 | 15.63 | 17.28 | 18.16 | 18.64 | 18.91 | 19.09 | 19.21 | 19.30 | 19.37 | 19.42 | 19.46 | 19.49 | 19.51 | 19.53 | 19.54 | 19.55 | 19.57 | 19.58 | 19.58 | 19.59 | 19.59 | 19.60 | 19.60 |
| 2007 | 0.05 | 1.14 | 4.33 | 8.11 | 10.75 | 15.69 | 18.80 | 21.34 | 22.73 | 23.49 | 23.93 | 24.19 | 24.35 | 24.46 | 24.54 | 24.60 | 24.64 | 24.68 | 24.70 | 24.72 | 24.73 | 24.74 | 24.75 | 24.76 | 24.77 | 24.78 | 24.78 | 24.79 | 24.79 | 24.79 |
| 2008 | 0.02 | 1.30 | 4.93 | 7.81 | 13.87 | 17.75 | 21.11 | 23.00 | 24.05 | 24.67 | 25.04 | 25.26 | 25.41 | 25.51 | 25.57 | 25.62 | 25.65 | 25.68 | 25.70 | 25.71 | 25.72 | 25.73 | 25.74 | 25.75 | 25.76 | 25.76 | 25.77 | 25.77 | 25.77 | 25.77 |
| 2009 | 0.02 | 0.75 | 2.53 | 6.67 | 10.44 | 14.23 | 16.53 | 17.91 | 18.75 | 19.28 | 19.61 | 19.82 | 19.96 | 20.06 | 20.13 | 20.17 | 20.21 | 20.23 | 20.25 | 20.27 | 20.29 | 20.30 | 20.31 | 20.32 | 20.33 | 20.33 | 20.34 | 20.34 | 20.34 | 20.35 |
| 2010 | 0.03 | 0.58 | 2.97 | 5.74 | 9.13 | 11.33 | 12.71 | 13.61 | 14.20 | 14.58 | 14.83 | 15.00 | 15.11 | 15.19 | 15.25 | 15.29 | 15.32 | 15.34 | 15.36 | 15.38 | 15.40 | 15.42 | 15.43 | 15.43 | 15.44 | 15.44 | 15.45 | 15.45 | 15.45 | 15.46 |
| 2011 | 0.02 | 0.83 | 2.60 | 5.00 | 6.84 | 8.04 | 8.84 | 9.38 | 9.75 | 10.00 | 10.17 | 10.30 | 10.39 | 10.45 | 10.50 | 10.54 | 10.56 | 10.59 | 10.61 | 10.63 | 10.64 | 10.66 | 10.66 | 10.67 | 10.68 | 10.68 | 10.68 | 10.69 | 10.69 | 10.69 |
| 2012 | 0.04 | 0.74 | 2.44 | 3.96 | 5.15 | 6.01 | 6.62 | 7.05 | 7.36 | 7.59 | 7.75 | 7.86 | 7.95 | 8.01 | 8.05 | 8.08 | 8.11 | 8.14 | 8.16 | 8.18 | 8.19 | 8.20 | 8.21 | 8.22 | 8.22 | 8.23 | 8.23 | 8.23 | 8.23 | 8.24 |
| 2013 | 0.02 | 0.55 | 1.56 | 2.54 | 3.42 | 4.10 | 4.59 | 4.96 | 5.23 | 5.41 | 5.55 | 5.64 | 5.71 | 5.76 | 5.79 | 5.82 | 5.84 | 5.87 | 5.88 | 5.89 | 5.90 | 5.91 | 5.91 | 5.92 | 5.92 | 5.92 | 5.92 | 5.93 | 5.93 | 5.93 |
| 2014 | 0.00 | 0.19 | 0.76 | 1.44 | 2.13 | 2.69 | 3.12 | 3.44 | 3.68 | 3.85 | 3.98 | 4.06 | 4.12 | 4.17 | 4.20 | 4.24 | 4.26 | 4.28 | 4.30 | 4.31 | 4.32 | 4.33 | 4.33 | 4.34 | 4.34 | 4.34 | 4.34 | 4.34 | 4.34 | 4.34 |
| 2015 | 0.01 | 0.20 | 0.74 | 1.38 | 2.03 | 2.57 | 2.99 | 3.31 | 3.55 | 3.72 | 3.84 | 3.93 | 3.99 | 4.04 | 4.08 | 4.12 | 4.15 | 4.17 | 4.19 | 4.20 | 4.21 | 4.22 | 4.22 | 4.23 | 4.23 | 4.23 | 4.23 | 4.24 | 4.24 | 4.24 |
| 2016 | 0.01 | 0.22 | 0.79 | 1.46 | 2.16 | 2.73 | 3.18 | 3.51 | 3.75 | 3.91 | 4.03 | 4.12 | 4.18 | 4.24 | 4.29 | 4.33 | 4.36 | 4.38 | 4.40 | 4.41 | 4.42 | 4.43 | 4.43 | 4.44 | 4.44 | 4.44 | 4.44 | 4.44 | 4.44 | 4.45 |
| 2017 | 0.01 | 0.24 | 0.86 | 1.61 | 2.37 | 2.99 | 3.47 | 3.82 | 4.07 | 4.24 | 4.36 | 4.45 | 4.52 | 4.59 | 4.64 | 4.68 | 4.70 | 4.73 | 4.74 | 4.75 | 4.76 | 4.77 | 4.78 | 4.78 | 4.78 | 4.78 | 4.79 | 4.79 | 4.79 | 4.79 |
| 2018 | 0.01 | 0.25 | 0.91 | 1.72 | 2.54 | 3.20 | 3.70 | 4.07 | 4.32 | 4.50 | 4.63 | 4.73 | 4.82 | 4.89 | 4.94 | 4.98 | 5.01 | 5.03 | 5.05 | 5.06 | 5.07 | 5.08 | 5.08 | 5.09 | 5.09 | 5.09 | 5.10 | 5.10 | 5.10 | 5.10 |

**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 | 2.26 | 25.61 | 47.69 | 51.65 | 57.82 | 62.14 | 69.69 | 76.96 | 79.41 | 82.36 | 86.60 | 90.65 | 92.23 | 93.05 | 93.62 | 93.91 | 94.14 | 94.31 | 94.50 | **94.64** | **94.78** | **94.90** | **94.98** | **95.04** | **95.09** | **95.13** | **95.16** | **95.19** | **95.22** | **95.24** |
| 1993 | 2.81 | 13.82 | 18.47 | 25.42 | 31.23 | 41.21 | 52.38 | 57.00 | 63.38 | 72.27 | 82.42 | 86.24 | 88.04 | 89.22 | 89.79 | 90.21 | 90.57 | 90.91 | **91.12** | **91.41** | **91.57** | **91.68** | **91.77** | **91.85** | **91.91** | **91.97** | **92.01** | **92.05** | **92.09** | **92.12** |
| 1994 | 1.78 | 5.77 | 12.21 | 18.26 | 27.23 | 37.97 | 43.49 | 50.86 | 60.80 | 74.85 | 80.89 | 83.91 | 85.66 | 86.68 | 87.41 | 88.03 | 88.57 | **88.95** | **89.46** | **89.72** | **89.88** | **90.03** | **90.14** | **90.24** | **90.33** | **90.40** | **90.46** | **90.52** | **90.57** | **90.61** |
| 1995 | 2.07 | 17.27 | 24.92 | 41.19 | 54.72 | 59.17 | 66.06 | 74.21 | 82.27 | 85.96 | 87.94 | 88.96 | 89.61 | 90.05 | 90.33 | 90.48 | **90.67** | **90.98** | **91.21** | **91.36** | **91.46** | **91.54** | **91.61** | **91.67** | **91.72** | **91.76** | **91.79** | **91.82** | **91.84** | **91.86** |
| 1996 | 2.07 | 7.92 | 24.00 | 40.55 | 46.28 | 55.31 | 67.33 | 80.16 | 85.51 | 88.09 | 89.41 | 90.11 | 90.56 | 90.89 | 91.19 | **91.40** | **91.75** | **91.95** | **92.08** | **92.19** | **92.28** | **92.34** | **92.40** | **92.46** | **92.50** | **92.54** | **92.57** | **92.60** | **92.62** | **92.64** |
| 1997 | 3.23 | 31.44 | 50.07 | 54.83 | 63.38 | 74.20 | 84.10 | 88.58 | 90.87 | 92.04 | 92.55 | 92.90 | 93.06 | 93.20 | **93.30** | **93.57** | **93.74** | **93.85** | **93.94** | **94.01** | **94.06** | **94.10** | **94.14** | **94.17** | **94.20** | **94.22** | **94.24** | **94.26** | **94.27** | **94.28** |
| 1998 | 4.11 | 20.16 | 26.58 | 39.42 | 58.25 | 79.41 | 87.18 | 90.61 | 92.16 | 93.01 | 93.49 | 93.85 | 94.09 | **94.31** | **94.71** | **94.89** | **95.00** | **95.10** | **95.17** | **95.24** | **95.29** | **95.34** | **95.39** | **95.42** | **95.46** | **95.48** | **95.51** | **95.53** | **95.54** | **95.56** |
| 1999 | 2.39 | 8.11 | 20.46 | 40.02 | 67.85 | 79.48 | 85.21 | 87.92 | 89.36 | 90.25 | 90.91 | 91.36 | **91.83** | **92.52** | **92.82** | **92.99** | **93.13** | **93.25** | **93.34** | **93.43** | **93.50** | **93.56** | **93.62** | **93.68** | **93.72** | **93.76** | **93.79** | **93.82** | **93.84** | **93.86** |
| 2000 | 3.44 | 35.17 | 58.58 | 76.48 | 85.24 | 89.16 | 91.07 | 91.97 | 92.41 | 92.72 | 92.94 | **93.17** | **93.64** | **93.92** | **94.11** | **94.25** | **94.37** | **94.46** | **94.54** | **94.61** | **94.66** | **94.70** | **94.74** | **94.77** | **94.80** | **94.82** | **94.84** | **94.85** | **94.87** | **94.88** |
| 2001 | 6.92 | 36.94 | 71.21 | 82.52 | 87.73 | 90.11 | 91.27 | 91.91 | 92.38 | 92.65 | **92.95** | **93.45** | **93.67** | **93.80** | **93.92** | **94.02** | **94.10** | **94.18** | **94.24** | **94.30** | **94.36** | **94.40** | **94.44** | **94.47** | **94.50** | **94.53** | **94.55** | **94.56** | **94.58** | **94.59** |
| 2002 | 9.01 | 51.96 | 69.19 | 77.97 | 82.15 | 84.45 | 85.73 | 86.85 | 87.55 | **88.32** | **89.41** | **89.88** | **90.15** | **90.37** | **90.56** | **90.71** | **90.85** | **90.97** | **91.08** | **91.19** | **91.28** | **91.35** | **91.42** | **91.47** | **91.52** | **91.56** | **91.59** | **91.62** | **91.65** | **91.67** |
| 2003 | 16.08 | 37.49 | 53.91 | 62.22 | 66.82 | 69.50 | 72.27 | 74.14 | **76.31** | **78.40** | **79.56** | **80.18** | **80.65** | **81.05** | **81.38** | **81.67** | **81.92** | **82.14** | **82.34** | **82.51** | **82.65** | **82.77** | **82.88** | **82.96** | **83.04** | **83.11** | **83.17** | **83.22** | **83.26** | **83.30** |
| 2004 | 10.30 | 29.08 | 40.05 | 46.68 | 50.37 | 53.52 | 55.94 | **59.13** | **62.54** | **64.69** | **65.84** | **66.75** | **67.53** | **68.20** | **68.77** | **69.25** | **69.66** | **70.02** | **70.33** | **70.60** | **70.81** | **71.00** | **71.16** | **71.29** | **71.42** | **71.52** | **71.62** | **71.70** | **71.77** | **71.82** |
| 2005 | 9.14 | 20.70 | 28.96 | 33.50 | 37.68 | 40.67 | **43.45** | **46.11** | **47.81** | **48.79** | **49.60** | **50.33** | **50.97** | **51.53** | **52.00** | **52.42** | **52.79** | **53.11** | **53.39** | **53.62** | **53.82** | **53.98** | **54.12** | **54.24** | **54.36** | **54.45** | **54.53** | **54.60** | **54.66** | **54.71** |
| 2006 | 3.76 | 14.31 | 20.88 | 28.58 | 32.64 | **35.57** | **38.33** | **40.03** | **41.04** | **41.92** | **42.73** | **43.47** | **44.13** | **44.71** | **45.24** | **45.73** | **46.14** | **46.51** | **46.82** | **47.08** | **47.30** | **47.49** | **47.65** | **47.80** | **47.93** | **48.04** | **48.13** | **48.21** | **48.28** | **48.33** |
| 2007 | 4.06 | 22.77 | 35.85 | 40.32 | **42.85** | **44.85** | **45.98** | **46.66** | **47.28** | **47.89** | **48.47** | **49.02** | **49.54** | **50.04** | **50.51** | **50.93** | **51.29** | **51.60** | **51.87** | **52.10** | **52.29** | **52.46** | **52.62** | **52.75** | **52.86** | **52.96** | **53.04** | **53.11** | **53.17** | **53.22** |
| 2008 | 4.07 | 28.95 | 35.11 | **38.18** | **40.10** | **41.30** | **42.04** | **42.72** | **43.42** | **44.11** | **44.77** | **45.39** | **45.98** | **46.51** | **46.99** | **47.41** | **47.77** | **48.08** | **48.34** | **48.57** | **48.78** | **48.96** | **49.12** | **49.26** | **49.38** | **49.48** | **49.57** | **49.64** | **49.71** | **49.76** |
| 2009 | 2.86 | 10.76 | **16.58** | **19.95** | **22.51** | **24.14** | **25.71** | **27.31** | **28.92** | **30.53** | **32.03** | **33.39** | **34.59** | **35.64** | **36.57** | **37.37** | **38.06** | **38.65** | **39.15** | **39.62** | **40.04** | **40.39** | **40.70** | **40.97** | **41.20** | **41.40** | **41.58** | **41.72** | **41.85** | **41.97** |
| 2010 | 2.61 | **8.01** | **12.88** | **16.51** | **18.80** | **20.99** | **23.20** | **25.41** | **27.59** | **29.68** | **31.57** | **33.23** | **34.68** | **35.95** | **37.06** | **38.00** | **38.82** | **39.51** | **40.14** | **40.72** | **41.21** | **41.63** | **41.99** | **42.31** | **42.58** | **42.81** | **43.01** | **43.19** | **43.34** | **43.47** |
| 2011 | **1.21** | **7.26** | **12.22** | **15.34** | **18.24** | **21.18** | **24.10** | **26.93** | **29.62** | **32.13** | **34.39** | **36.37** | **38.08** | **39.53** | **40.75** | **41.79** | **42.68** | **43.47** | **44.19** | **44.80** | **45.32** | **45.77** | **46.15** | **46.48** | **46.77** | **47.02** | **47.23** | **47.42** | **47.57** | **47.71** |
| 2012 | **3.21** | **10.51** | **16.29** | **21.16** | **25.78** | **30.02** | **33.91** | **37.48** | **40.79** | **43.78** | **46.34** | **48.49** | **50.26** | **51.72** | **52.93** | **53.95** | **54.85** | **55.64** | **56.31** | **56.88** | **57.36** | **57.77** | **58.12** | **58.42** | **58.68** | **58.90** | **59.10** | **59.26** | **59.39** | **59.51** |
| 2013 | **3.67** | **16.21** | **28.80** | **38.96** | **47.06** | **54.26** | **60.39** | **65.69** | **69.99** | **73.41** | **76.02** | **78.03** | **79.59** | **80.81** | **81.78** | **82.60** | **83.30** | **83.86** | **84.32** | **84.70** | **85.02** | **85.29** | **85.51** | **85.70** | **85.85** | **85.98** | **86.09** | **86.18** | **86.26** | **86.32** |
| 2014 | **1.99** | **17.04** | **31.30** | **41.59** | **49.73** | **56.79** | **62.77** | **67.77** | **71.80** | **75.01** | **77.47** | **79.33** | **80.76** | **81.88** | **82.80** | **83.57** | **84.20** | **84.71** | **85.14** | **85.49** | **85.77** | **86.01** | **86.21** | **86.38** | **86.53** | **86.64** | **86.74** | **86.82** | **86.89** | **86.95** |
| 2015 | **3.10** | **16.75** | **28.87** | **38.22** | **45.98** | **52.73** | **58.64** | **63.58** | **67.60** | **70.82** | **73.30** | **75.17** | **76.63** | **77.84** | **78.86** | **79.69** | **80.37** | **80.94** | **81.40** | **81.78** | **82.09** | **82.35** | **82.57** | **82.76** | **82.92** | **83.04** | **83.15** | **83.24** | **83.32** | **83.39** |
| 2016 | **3.51** | **16.51** | **28.54** | **37.99** | **45.93** | **52.91** | **58.62** | **63.35** | **67.20** | **70.31** | **72.72** | **74.56** | **76.09** | **77.35** | **78.37** | **79.19** | **79.84** | **80.38** | **80.82** | **81.19** | **81.51** | **81.77** | **82.00** | **82.18** | **82.34** | **82.46** | **82.57** | **82.66** | **82.74** | **82.81** |
| 2017 | **3.28** | **16.47** | **28.80** | **38.73** | **47.02** | **53.85** | **59.42** | **63.96** | **67.69** | **70.73** | **73.10** | **75.04** | **76.63** | **77.89** | **78.88** | **79.68** | **80.32** | **80.84** | **81.28** | **81.64** | **81.94** | **82.20** | **82.41** | **82.59** | **82.73** | **82.85** | **82.96** | **83.04** | **83.12** | **83.18** |
| 2018 | **3.04** | **15.84** | **27.97** | **37.88** | **45.99** | **52.62** | **58.04** | **62.40** | **66.05** | **69.04** | **71.52** | **73.55** | **75.13** | **76.38** | **77.38** | **78.19** | **78.85** | **79.39** | **79.84** | **80.21** | **80.51** | **80.76** | **80.97** | **81.15** | **81.29** | **81.42** | **81.53** | **81.62** | **81.70** | **81.77** |

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1997 | 0.00 | 0.07 | 0.33 | 0.49 | 0.50 | 0.41 | 0.27 | 0.37 | 0.50 | 0.38 | 0.19 | 0.04 | 0.12 | 0.16 | **0.03** |
| 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 | **0.05** | **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 | **0.05** | **0.16** | **0.06** |
| 2000 | 0.00 | 0.11 | 0.57 | 1.22 | 1.75 | 0.92 | 0.87 | 0.41 | 0.37 | 0.49 | 0.57 | **0.33** | **0.45** | **0.18** | **0.17** |
| 2001 | 0.00 | 0.12 | 0.54 | 0.97 | 0.91 | 0.92 | 0.71 | 0.47 | 0.79 | 0.32 | **0.43** | **0.44** | **0.17** | **0.17** | **0.09** |
| 2002 | 0.02 | 0.14 | 0.49 | 0.62 | 0.60 | 0.35 | 0.31 | 0.21 | 0.39 | **0.28** | **0.39** | **0.18** | **0.19** | **0.10** | **0.06** |
| 2003 | 0.01 | 0.16 | 0.32 | 0.32 | 0.20 | 0.22 | 0.41 | 0.38 | **0.32** | **0.56** | **0.23** | **0.24** | **0.12** | **0.07** | **0.04** |
| 2004 | 0.04 | 0.17 | 0.26 | 0.36 | 0.42 | 0.45 | 0.50 | **0.42** | **0.58** | **0.29** | **0.32** | **0.16** | **0.10** | **0.06** | **0.04** |
| 2005 | 0.02 | 0.62 | 1.67 | 1.47 | 1.61 | 1.54 | **0.94** | **1.40** | **0.87** | **1.01** | **0.54** | **0.35** | **0.23** | **0.16** | **0.11** |
| 2006 | 0.05 | 1.29 | 2.18 | 2.70 | 2.69 | **1.65** | **2.93** | **1.57** | **1.74** | **1.01** | **0.64** | **0.42** | **0.28** | **0.19** | **0.13** |
| 2007 | 0.01 | 0.82 | 2.24 | 2.56 | **2.12** | **4.36** | **2.14** | **2.30** | **1.40** | **0.92** | **0.61** | **0.41** | **0.28** | **0.20** | **0.14** |
| 2008 | 0.01 | 0.35 | 1.25 | **1.53** | **3.07** | **1.81** | **1.72** | **0.96** | **0.64** | **0.45** | **0.31** | **0.21** | **0.15** | **0.11** | **0.07** |
| 2009 | 0.01 | 0.17 | **0.27** | **0.77** | **0.67** | **0.68** | **0.38** | **0.26** | **0.20** | **0.15** | **0.10** | **0.07** | **0.05** | **0.03** | **0.02** |
| 2010 | 0.00 | **0.04** | **0.22** | **0.29** | **0.37** | **0.23** | **0.18** | **0.14** | **0.11** | **0.08** | **0.06** | **0.04** | **0.03** | **0.02** | **0.01** |
| 2011 | **0.00** | **0.12** | **0.29** | **0.46** | **0.33** | **0.27** | **0.22** | **0.18** | **0.14** | **0.11** | **0.08** | **0.06** | **0.04** | **0.03** | **0.02** |
| 2012 | **0.01** | **0.15** | **0.48** | **0.47** | **0.48** | **0.43** | **0.36** | **0.30** | **0.25** | **0.21** | **0.15** | **0.11** | **0.08** | **0.06** | **0.04** |
| 2013 | **0.01** | **0.22** | **0.48** | **0.63** | **0.68** | **0.62** | **0.54** | **0.46** | **0.39** | **0.33** | **0.25** | **0.19** | **0.13** | **0.10** | **0.07** |
| 2014 | **0.01** | **0.20** | **0.52** | **0.66** | **0.69** | **0.62** | **0.55** | **0.48** | **0.42** | **0.35** | **0.26** | **0.19** | **0.14** | **0.10** | **0.07** |
| 2015 | **0.01** | **0.23** | **0.60** | **0.74** | **0.75** | **0.68** | **0.60** | **0.53** | **0.45** | **0.37** | **0.28** | **0.20** | **0.14** | **0.11** | **0.08** |
| 2016 | **0.01** | **0.24** | **0.61** | **0.74** | **0.76** | **0.71** | **0.63** | **0.55** | **0.47** | **0.39** | **0.28** | **0.20** | **0.15** | **0.12** | **0.09** |
| 2017 | **0.01** | **0.26** | **0.64** | **0.75** | **0.78** | **0.75** | **0.67** | **0.58** | **0.49** | **0.40** | **0.30** | **0.23** | **0.19** | **0.13** | **0.09** |
| 2018 | **0.01** | **0.25** | **0.62** | **0.73** | **0.78** | **0.74** | **0.66** | **0.56** | **0.46** | **0.38** | **0.30** | **0.25** | **0.18** | **0.13** | **0.09** |

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1997 | 0.94 | 7.38 | 13.88 | 8.80 | 13.57 | 20.22 | 26.28 | 19.68 | 15.86 | 13.32 | 11.75 | 10.52 | 10.38 | 10.34 | **14.28** |
| 1998 | 1.05 | 6.04 | 6.78 | 11.66 | 18.90 | 30.74 | 21.68 | 17.69 | 14.77 | 12.21 | 9.80 | 10.35 | 9.10 | **14.24** | **30.47** |
| 1999 | 0.87 | 3.50 | 9.77 | 17.23 | 29.97 | 22.05 | 17.64 | 13.81 | 10.78 | 9.01 | 7.87 | 7.12 | **11.57** | **24.47** | **23.23** |
| 2000 | 0.78 | 18.19 | 29.03 | 36.77 | 25.52 | 21.05 | 16.18 | 10.70 | 8.27 | 7.70 | 6.83 | **6.87** | **21.15** | **20.81** | **30.98** |
| 2001 | 2.23 | 14.51 | 38.64 | 29.36 | 23.60 | 15.19 | 12.60 | 11.26 | 7.12 | 8.57 | **7.31** | **13.03** | **14.55** | **22.61** | **23.31** |
| 2002 | 2.25 | 26.89 | 26.50 | 20.85 | 16.63 | 12.63 | 10.25 | 8.05 | 7.38 | **6.77** | **9.27** | **11.50** | **15.38** | **15.06** | **17.45** |
| 2003 | 4.65 | 15.83 | 19.07 | 15.65 | 12.71 | 10.26 | 8.90 | 8.67 | **7.91** | **9.08** | **9.66** | **9.43** | **10.06** | **13.33** | **15.73** |
| 2004 | 4.86 | 14.67 | 13.62 | 11.62 | 8.70 | 8.04 | 7.41 | **7.32** | **9.16** | **8.87** | **6.96** | **7.68** | **10.49** | **13.66** | **14.80** |
| 2005 | 5.28 | 11.32 | 10.84 | 9.78 | 8.17 | 7.11 | **6.42** | **5.86** | **5.91** | **4.22** | **3.51** | **4.72** | **6.47** | **8.49** | **9.59** |
| 2006 | 3.70 | 10.59 | 11.66 | 12.40 | 9.17 | **5.85** | **4.88** | **5.00** | **4.24** | **3.05** | **3.17** | **4.23** | **5.92** | **8.00** | **11.17** |
| 2007 | 3.53 | 12.43 | 16.54 | 9.95 | **6.31** | **4.54** | **4.77** | **4.48** | **3.28** | **3.23** | **3.35** | **4.49** | **6.27** | **10.06** | **13.28** |
| 2008 | 1.51 | 17.57 | 13.35 | **8.37** | **4.81** | **5.23** | **4.40** | **3.45** | **3.40** | **3.31** | **3.34** | **4.42** | **6.71** | **9.52** | **11.76** |
| 2009 | 4.41 | 7.59 | **8.62** | **5.73** | **5.31** | **4.36** | **3.66** | **3.59** | **3.49** | **3.40** | **3.44** | **4.63** | **6.56** | **8.90** | **11.00** |
| 2010 | 0.91 | **5.32** | **6.28** | **5.28** | **4.49** | **3.83** | **3.75** | **3.66** | **3.56** | **3.46** | **3.57** | **4.81** | **6.76** | **9.16** | **11.19** |
| 2011 | **1.67** | **5.27** | **5.27** | **4.42** | **3.65** | **3.58** | **3.50** | **3.41** | **3.32** | **3.28** | **3.38** | **4.55** | **6.39** | **8.67** | **10.61** |
| 2012 | **3.95** | **5.58** | **6.65** | **5.99** | **5.77** | **5.58** | **5.59** | **5.42** | **5.52** | **5.40** | **5.53** | **7.27** | **9.99** | **13.30** | **15.93** |
| 2013 | **3.45** | **7.87** | **8.04** | **7.56** | **7.35** | **7.54** | **7.62** | **7.46** | **7.79** | **7.37** | **7.27** | **9.66** | **13.25** | **17.31** | **21.20** |
| 2014 | **3.16** | **5.72** | **5.82** | **5.78** | **5.91** | **6.75** | **6.77** | **7.34** | **7.27** | **7.02** | **7.13** | **9.34** | **12.68** | **16.36** | **20.97** |
| 2015 | **2.95** | **5.39** | **5.48** | **5.85** | **6.19** | **6.73** | **6.96** | **6.97** | **6.71** | **6.38** | **6.45** | **8.47** | **11.19** | **16.42** | **20.66** |
| 2016 | **2.99** | **5.32** | **5.76** | **6.62** | **6.90** | **7.33** | **7.41** | **6.84** | **6.53** | **6.48** | **6.47** | **8.30** | **12.74** | **17.77** | **20.78** |
| 2017 | **2.90** | **5.37** | **6.10** | **6.90** | **7.63** | **7.74** | **7.46** | **7.22** | **6.93** | **6.54** | **6.61** | **9.39** | **13.80** | **17.72** | **20.85** |
| 2018 | **2.89** | **5.42** | **6.27** | **7.02** | **7.22** | **6.98** | **6.76** | **6.37** | **6.17** | **5.77** | **6.53** | **9.25** | **12.63** | **16.58** | **19.81** |

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1997 | 0.00 | 0.08 | 0.39 | 0.78 | 1.14 | 1.40 | 1.53 | 1.66 | 1.80 | 1.89 | 1.92 | 1.93 | 1.95 | 1.98 | **1.98** |
| 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** | **1.50** | **1.51** |
| 2000 | 0.00 | 0.11 | 0.58 | 1.28 | 1.89 | 2.13 | 2.29 | 2.36 | 2.41 | 2.48 | 2.55 | **2.58** | **2.63** | **2.64** | **2.66** |
| 2001 | 0.00 | 0.12 | 0.58 | 1.08 | 1.40 | 1.64 | 1.80 | 1.89 | 2.02 | 2.07 | **2.13** | **2.19** | **2.21** | **2.23** | **2.24** |
| 2002 | 0.02 | 0.16 | 0.51 | 0.83 | 1.07 | 1.19 | 1.28 | 1.33 | 1.43 | **1.49** | **1.57** | **1.60** | **1.63** | **1.65** | **1.65** |
| 2003 | 0.01 | 0.16 | 0.42 | 0.63 | 0.74 | 0.84 | 1.02 | 1.17 | **1.28** | **1.46** | **1.53** | **1.59** | **1.62** | **1.63** | **1.64** |
| 2004 | 0.04 | 0.21 | 0.42 | 0.67 | 0.93 | 1.18 | 1.44 | **1.64** | **1.90** | **2.01** | **2.13** | **2.18** | **2.21** | **2.23** | **2.24** |
| 2005 | 0.02 | 0.62 | 2.02 | 3.10 | 4.14 | 5.05 | **5.55** | **6.25** | **6.66** | **7.09** | **7.32** | **7.45** | **7.54** | **7.60** | **7.63** |
| 2006 | 0.05 | 1.33 | 3.22 | 5.23 | 6.92 | **7.83** | **9.36** | **10.11** | **10.90** | **11.33** | **11.58** | **11.75** | **11.85** | **11.92** | **11.97** |
| 2007 | 0.01 | 0.83 | 2.74 | 4.51 | **5.78** | **8.21** | **9.29** | **10.38** | **11.00** | **11.39** | **11.64** | **11.79** | **11.90** | **11.97** | **12.02** |
| 2008 | 0.01 | 0.36 | 1.39 | **2.46** | **4.42** | **5.49** | **6.42** | **6.92** | **7.23** | **7.45** | **7.59** | **7.68** | **7.74** | **7.79** | **7.81** |
| 2009 | 0.01 | 0.18 | **0.42** | **1.07** | **1.59** | **2.10** | **2.36** | **2.54** | **2.67** | **2.76** | **2.82** | **2.86** | **2.89** | **2.91** | **2.92** |
| 2010 | 0.00 | **0.04** | **0.25** | **0.52** | **0.83** | **1.02** | **1.17** | **1.27** | **1.35** | **1.41** | **1.45** | **1.48** | **1.50** | **1.51** | **1.51** |
| 2011 | **0.00** | **0.12** | **0.40** | **0.81** | **1.09** | **1.31** | **1.49** | **1.62** | **1.73** | **1.81** | **1.87** | **1.90** | **1.93** | **1.95** | **1.96** |
| 2012 | **0.01** | **0.16** | **0.60** | **1.00** | **1.38** | **1.70** | **1.95** | **2.15** | **2.31** | **2.43** | **2.51** | **2.57** | **2.61** | **2.63** | **2.65** |
| 2013 | **0.01** | **0.23** | **0.66** | **1.18** | **1.69** | **2.12** | **2.47** | **2.74** | **2.95** | **3.11** | **3.23** | **3.31** | **3.36** | **3.39** | **3.41** |
| 2014 | **0.01** | **0.21** | **0.69** | **1.26** | **1.82** | **2.29** | **2.67** | **2.98** | **3.23** | **3.43** | **3.56** | **3.66** | **3.72** | **3.75** | **3.78** |
| 2015 | **0.01** | **0.24** | **0.80** | **1.44** | **2.05** | **2.57** | **2.99** | **3.33** | **3.60** | **3.81** | **3.95** | **4.05** | **4.11** | **4.15** | **4.18** |
| 2016 | **0.01** | **0.25** | **0.82** | **1.47** | **2.08** | **2.61** | **3.03** | **3.38** | **3.65** | **3.86** | **4.00** | **4.10** | **4.17** | **4.21** | **4.24** |
| 2017 | **0.01** | **0.27** | **0.86** | **1.51** | **2.14** | **2.69** | **3.14** | **3.50** | **3.78** | **3.99** | **4.14** | **4.24** | **4.32** | **4.37** | **4.40** |
| 2018 | **0.01** | **0.26** | **0.84** | **1.47** | **2.10** | **2.64** | **3.09** | **3.44** | **3.71** | **3.91** | **4.06** | **4.18** | **4.26** | **4.31** | **4.34** |

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1997 | 0.96 | 8.41 | 21.29 | 28.30 | 38.14 | 50.66 | 63.56 | 70.59 | 75.14 | 78.49 | 81.32 | 83.22 | 84.95 | 86.59 | **88.95** |
| 1998 | 1.07 | 7.16 | 13.58 | 23.85 | 38.45 | 57.59 | 66.78 | 72.63 | 76.62 | 79.50 | 81.65 | 83.54 | 85.06 | **87.37** | **91.40** |
| 1999 | 0.88 | 4.43 | 13.95 | 28.96 | 50.54 | 61.47 | 68.23 | 72.57 | 75.52 | 77.81 | 79.76 | 81.23 | **83.52** | **87.55** | **90.87** |
| 2000 | 0.79 | 19.13 | 42.87 | 64.02 | 73.02 | 78.41 | 81.63 | 83.41 | 84.65 | 85.80 | 86.75 | **87.56** | **89.87** | **91.70** | **94.03** |
| 2001 | 2.27 | 16.75 | 49.45 | 64.36 | 72.68 | 76.70 | 79.51 | 81.69 | 82.93 | 84.31 | **85.37** | **87.12** | **88.87** | **91.20** | **93.21** |
| 2002 | 2.30 | 29.13 | 48.17 | 59.07 | 65.88 | 70.16 | 73.18 | 75.31 | 77.10 | **78.65** | **80.59** | **82.82** | **85.45** | **87.73** | **90.23** |
| 2003 | 4.75 | 20.15 | 35.65 | 45.85 | 52.80 | 57.70 | 61.53 | 64.89 | **67.70** | **70.66** | **73.53** | **76.06** | **78.59** | **81.73** | **85.38** |
| 2004 | 4.99 | 19.22 | 30.40 | 38.61 | 44.02 | 48.60 | 52.47 | **55.97** | **60.04** | **63.61** | **66.17** | **68.86** | **72.34** | **76.64** | **81.08** |
| 2005 | 5.45 | 16.35 | 25.53 | 32.78 | 38.17 | 42.39 | **45.87** | **48.87** | **51.70** | **53.58** | **55.10** | **57.10** | **59.79** | **63.29** | **67.35** |
| 2006 | 3.76 | 14.11 | 24.11 | 33.28 | 39.02 | **42.24** | **44.79** | **47.21** | **49.11** | **50.41** | **51.72** | **53.43** | **55.76** | **58.86** | **63.39** |
| 2007 | 3.59 | 15.74 | 29.79 | 36.60 | **40.38** | **42.92** | **45.38** | **47.50** | **48.97** | **50.35** | **51.73** | **53.54** | **56.01** | **59.94** | **65.10** |
| 2008 | 1.53 | 19.16 | 30.04 | **35.84** | **38.94** | **42.04** | **44.46** | **46.26** | **47.95** | **49.55** | **51.11** | **53.13** | **56.13** | **60.26** | **65.38** |
| 2009 | 4.50 | 11.93 | **19.59** | **24.38** | **28.54** | **31.75** | **34.33** | **36.76** | **39.04** | **41.19** | **43.31** | **46.10** | **49.98** | **55.11** | **61.61** |
| 2010 | 0.93 | **6.30** | **12.46** | **17.29** | **21.19** | **24.35** | **27.34** | **30.14** | **32.78** | **35.26** | **37.76** | **41.07** | **45.61** | **51.63** | **59.24** |
| 2011 | **1.68** | **6.95** | **11.94** | **15.89** | **19.00** | **21.95** | **24.72** | **27.33** | **29.80** | **32.17** | **34.55** | **37.72** | **42.08** | **47.88** | **55.26** |
| 2012 | **3.98** | **9.42** | **15.51** | **20.59** | **25.17** | **29.33** | **33.24** | **36.81** | **40.25** | **43.42** | **46.53** | **50.46** | **55.55** | **61.86** | **69.11** |
| 2013 | **3.48** | **11.18** | **18.41** | **24.64** | **30.20** | **35.46** | **40.34** | **44.74** | **48.99** | **52.69** | **56.11** | **60.39** | **65.77** | **72.07** | **79.08** |
| 2014 | **3.19** | **8.81** | **14.19** | **19.19** | **23.98** | **29.08** | **33.84** | **38.63** | **43.02** | **46.95** | **50.68** | **55.29** | **61.04** | **67.72** | **75.74** |
| 2015 | **2.98** | **8.28** | **13.37** | **18.48** | **23.53** | **28.64** | **33.54** | **38.09** | **42.15** | **45.74** | **49.17** | **53.43** | **58.66** | **65.80** | **73.82** |
| 2016 | **3.02** | **8.25** | **13.60** | **19.35** | **24.91** | **30.37** | **35.46** | **39.79** | **43.64** | **47.19** | **50.52** | **54.57** | **60.36** | **67.55** | **75.12** |
| 2017 | **2.93** | **8.21** | **13.88** | **19.85** | **25.97** | **31.66** | **36.68** | **41.15** | **45.11** | **48.59** | **51.89** | **56.35** | **62.36** | **69.17** | **76.42** |
| 2018 | **2.92** | **8.26** | **14.09** | **20.16** | **25.92** | **31.05** | **35.64** | **39.65** | **43.27** | **46.44** | **49.85** | **54.41** | **60.14** | **66.93** | **74.35** |

**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 | 0.04 | 0.09 | 0.20 | 0.22 | 0.12 | 0.25 | 0.15 | 0.11 | 0.13 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 |
| 1993 | 0.00 | 0.04 | 0.10 | 0.15 | 0.19 | 0.14 | 0.12 | 0.13 | 0.08 | 0.06 | 0.02 | 0.03 | 0.00 | 0.03 | 0.01 |
| 1994 | 0.00 | 0.06 | 0.21 | 0.25 | 0.28 | 0.23 | 0.19 | 0.10 | 0.10 | 0.05 | 0.05 | 0.05 | 0.02 | 0.01 | 0.02 |
| 1995 | 0.01 | 0.15 | 0.40 | 0.62 | 0.44 | 0.37 | 0.49 | 0.27 | 0.18 | 0.18 | 0.00 | 0.22 | 0.00 | 0.00 | 0.03 |
| 1996 | 0.00 | 0.05 | 0.14 | 0.33 | 0.29 | 0.33 | 0.23 | 0.10 | 0.20 | 0.07 | 0.06 | 0.04 | 0.00 | 0.01 | 0.00 |
| 1997 | 0.00 | 0.14 | 0.16 | 0.40 | 0.34 | 0.20 | 0.16 | 0.15 | 0.25 | 0.06 | 0.03 | 0.00 | 0.09 | 0.00 | **0.02** |
| 1998 | 0.00 | 0.01 | 0.13 | 0.16 | 0.23 | 0.12 | 0.13 | 0.15 | 0.03 | 0.03 | 0.05 | 0.03 | 0.12 | **0.02** | **0.12** |
| 1999 | 0.00 | 0.03 | 0.08 | 0.09 | 0.18 | 0.15 | 0.11 | 0.09 | 0.06 | 0.01 | 0.09 | 0.13 | **0.05** | **0.17** | **0.08** |
| 2000 | 0.00 | 0.08 | 0.13 | 0.28 | 0.29 | 0.21 | 0.21 | 0.33 | 0.30 | 0.43 | 0.35 | **0.04** | **0.24** | **0.15** | **0.14** |
| 2001 | 0.00 | 0.05 | 0.10 | 0.23 | 0.62 | 0.35 | 0.20 | 0.12 | 0.32 | 0.48 | **0.35** | **0.31** | **0.15** | **0.13** | **0.06** |
| 2002 | 0.00 | 0.04 | 0.24 | 0.18 | 0.21 | 0.15 | 0.15 | 0.17 | 0.11 | **0.17** | **0.23** | **0.14** | **0.12** | **0.06** | **0.03** |
| 2003 | 0.00 | 0.04 | 0.13 | 0.17 | 0.10 | 0.18 | 0.15 | 0.33 | **0.17** | **0.28** | **0.15** | **0.12** | **0.07** | **0.04** | **0.02** |
| 2004 | 0.01 | 0.09 | 0.18 | 0.16 | 0.16 | 0.26 | 0.37 | **0.26** | **0.33** | **0.19** | **0.16** | **0.09** | **0.06** | **0.04** | **0.02** |
| 2005 | 0.01 | 0.11 | 0.12 | 0.22 | 0.42 | 0.53 | **0.27** | **0.51** | **0.30** | **0.24** | **0.12** | **0.07** | **0.05** | **0.03** | **0.02** |
| 2006 | 0.00 | 0.05 | 0.10 | 0.53 | 0.69 | **0.34** | **0.61** | **0.45** | **0.38** | **0.19** | **0.10** | **0.07** | **0.04** | **0.03** | **0.02** |
| 2007 | 0.00 | 0.14 | 0.09 | 1.06 | **0.64** | **1.64** | **1.18** | **0.88** | **0.42** | **0.23** | **0.14** | **0.09** | **0.07** | **0.05** | **0.04** |
| 2008 | 0.00 | 0.09 | 0.64 | **0.95** | **1.86** | **1.19** | **0.86** | **0.44** | **0.26** | **0.16** | **0.10** | **0.07** | **0.05** | **0.04** | **0.02** |
| 2009 | 0.00 | 0.09 | **0.26** | **0.87** | **0.74** | **0.58** | **0.32** | **0.21** | **0.15** | **0.10** | **0.07** | **0.05** | **0.03** | **0.02** | **0.01** |
| 2010 | 0.00 | **0.10** | **0.46** | **0.56** | **0.52** | **0.31** | **0.21** | **0.15** | **0.10** | **0.07** | **0.05** | **0.03** | **0.02** | **0.02** | **0.01** |
| 2011 | **0.01** | **0.10** | **0.21** | **0.29** | **0.21** | **0.16** | **0.12** | **0.09** | **0.07** | **0.05** | **0.03** | **0.02** | **0.02** | **0.01** | **0.01** |
| 2012 | **0.01** | **0.09** | **0.19** | **0.21** | **0.19** | **0.16** | **0.13** | **0.10** | **0.08** | **0.06** | **0.04** | **0.03** | **0.02** | **0.02** | **0.01** |
| 2013 | **0.01** | **0.08** | **0.16** | **0.25** | **0.28** | **0.26** | **0.22** | **0.19** | **0.15** | **0.12** | **0.10** | **0.08** | **0.06** | **0.05** | **0.03** |
| 2014 | **0.00** | **0.06** | **0.14** | **0.23** | **0.26** | **0.25** | **0.22** | **0.18** | **0.15** | **0.12** | **0.09** | **0.07** | **0.05** | **0.04** | **0.03** |
| 2015 | **0.01** | **0.06** | **0.14** | **0.20** | **0.22** | **0.20** | **0.18** | **0.15** | **0.12** | **0.09** | **0.07** | **0.05** | **0.04** | **0.03** | **0.02** |
| 2016 | **0.01** | **0.06** | **0.14** | **0.20** | **0.22** | **0.21** | **0.19** | **0.16** | **0.14** | **0.10** | **0.08** | **0.06** | **0.04** | **0.03** | **0.02** |
| 2017 | **0.01** | **0.06** | **0.14** | **0.21** | **0.23** | **0.22** | **0.20** | **0.17** | **0.14** | **0.10** | **0.08** | **0.06** | **0.05** | **0.03** | **0.02** |
| 2018 | **0.01** | **0.06** | **0.14** | **0.20** | **0.23** | **0.22** | **0.19** | **0.16** | **0.12** | **0.09** | **0.07** | **0.06** | **0.04** | **0.03** | **0.02** |

**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 | 0.57 | 8.68 | 17.15 | 7.41 | 11.32 | 10.21 | 15.15 | 17.34 | 10.84 | 13.87 | 20.92 | 23.97 | 20.12 | 19.82 | 22.25 |
| 1993 | 1.00 | 6.27 | 5.69 | 8.99 | 9.14 | 13.14 | 16.08 | 10.79 | 13.49 | 18.33 | 25.45 | 20.18 | 17.78 | 19.97 | 21.01 |
| 1994 | 1.34 | 3.95 | 6.96 | 7.53 | 10.88 | 13.60 | 9.60 | 12.23 | 16.28 | 22.57 | 18.97 | 17.15 | 18.00 | 17.52 | 26.92 |
| 1995 | 1.91 | 9.17 | 8.31 | 12.82 | 16.81 | 9.89 | 12.17 | 18.19 | 22.00 | 17.94 | 14.56 | 14.13 | 16.63 | 13.30 | 22.78 |
| 1996 | 0.80 | 4.24 | 9.22 | 13.63 | 9.24 | 12.50 | 17.93 | 26.32 | 21.67 | 16.55 | 16.13 | 13.51 | 14.60 | 17.29 | 23.52 |
| 1997 | 1.20 | 8.54 | 14.01 | 8.34 | 10.83 | 19.02 | 26.50 | 21.70 | 17.65 | 16.50 | 13.44 | 11.64 | 11.80 | 15.14 | **16.35** |
| 1998 | 1.02 | 6.68 | 6.23 | 9.81 | 15.86 | 29.57 | 22.68 | 16.44 | 15.34 | 12.47 | 12.24 | 11.47 | 12.69 | **15.96** | **32.99** |
| 1999 | 1.13 | 3.96 | 8.13 | 13.51 | 25.54 | 20.61 | 16.00 | 13.88 | 11.23 | 9.92 | 9.28 | 9.99 | **13.19** | **27.23** | **31.80** |
| 2000 | 2.14 | 11.90 | 17.32 | 27.50 | 24.98 | 17.53 | 15.53 | 10.52 | 9.22 | 8.33 | 8.61 | **8.38** | **21.25** | **26.43** | **32.21** |
| 2001 | 1.23 | 12.10 | 35.86 | 28.39 | 21.00 | 13.95 | 11.84 | 10.62 | 8.27 | 8.18 | **7.54** | **13.21** | **18.69** | **21.63** | **22.80** |
| 2002 | 2.31 | 22.14 | 20.79 | 18.49 | 13.49 | 10.96 | 8.93 | 8.20 | 8.01 | **7.30** | **10.25** | **13.62** | **14.91** | **16.44** | **20.58** |
| 2003 | 4.54 | 11.56 | 15.21 | 12.67 | 10.19 | 8.33 | 7.52 | 7.19 | **7.61** | **10.76** | **9.76** | **9.47** | **11.61** | **16.37** | **20.45** |
| 2004 | 4.46 | 10.62 | 10.88 | 9.03 | 7.04 | 6.16 | 6.03 | **6.88** | **11.05** | **9.26** | **6.92** | **8.68** | **12.63** | **17.35** | **19.43** |
| 2005 | 4.14 | 8.17 | 8.35 | 6.34 | 4.92 | 5.21 | **5.41** | **7.86** | **6.49** | **4.06** | **3.48** | **5.02** | **7.30** | **10.07** | **11.77** |
| 2006 | 2.56 | 7.60 | 7.14 | 6.93 | 5.86 | **4.86** | **7.20** | **6.17** | **4.05** | **2.83** | **2.86** | **4.16** | **6.20** | **8.90** | **12.03** |
| 2007 | 1.04 | 8.93 | 11.27 | 8.58 | **5.56** | **7.62** | **6.93** | **4.87** | **3.48** | **3.16** | **3.10** | **4.37** | **6.55** | **10.23** | **13.80** |
| 2008 | 1.26 | 8.52 | 8.21 | **6.04** | **7.80** | **7.38** | **5.18** | **4.09** | **3.74** | **3.39** | **3.22** | **4.47** | **6.81** | **9.93** | **12.97** |
| 2009 | 0.80 | 5.80 | **6.76** | **7.01** | **6.99** | **5.68** | **4.99** | **4.62** | **4.21** | **3.81** | **3.56** | **4.82** | **7.22** | **10.44** | **13.82** |
| 2010 | 1.45 | **4.89** | **5.46** | **6.72** | **5.87** | **5.31** | **5.03** | **4.61** | **4.18** | **3.78** | **3.90** | **5.69** | **8.44** | **11.97** | **14.74** |
| 2011 | **0.69** | **3.40** | **5.57** | **6.90** | **6.32** | **6.01** | **5.58** | **5.08** | **4.60** | **4.17** | **4.28** | **6.27** | **9.31** | **13.19** | **16.27** |
| 2012 | **2.28** | **4.11** | **5.73** | **7.06** | **6.96** | **6.51** | **6.03** | **5.50** | **5.07** | **4.61** | **4.88** | **7.12** | **10.42** | **14.61** | **17.62** |
| 2013 | **2.33** | **4.89** | **7.77** | **10.51** | **10.25** | **9.71** | **9.28** | **8.61** | **8.25** | **7.60** | **7.59** | **10.90** | **15.74** | **21.28** | **25.97** |
| 2014 | **1.62** | **4.07** | **6.26** | **8.82** | **9.12** | **9.13** | **8.59** | **8.41** | **7.85** | **7.11** | **6.81** | **9.41** | **13.76** | **18.85** | **24.94** |
| 2015 | **1.75** | **3.79** | **5.74** | **8.13** | **8.42** | **8.31** | **8.04** | **7.43** | **6.70** | **6.03** | **5.91** | **8.36** | **12.10** | **18.27** | **23.66** |
| 2016 | **1.83** | **3.76** | **5.92** | **8.64** | **8.86** | **8.69** | **8.62** | **7.81** | **7.03** | **6.33** | **6.14** | **8.43** | **12.97** | **19.01** | **23.25** |
| 2017 | **1.76** | **3.78** | **6.23** | **9.06** | **9.68** | **9.50** | **8.79** | **7.97** | **7.15** | **6.35** | **6.19** | **9.27** | **14.13** | **19.43** | **23.70** |
| 2018 | **1.73** | **3.81** | **6.29** | **9.22** | **9.37** | **8.66** | **7.97** | **7.13** | **6.42** | **5.66** | **6.07** | **9.21** | **13.48** | **18.79** | **23.10** |

**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 | 0.04 | 0.13 | 0.28 | 0.43 | 0.51 | 0.65 | 0.72 | 0.76 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 |
| 1993 | 0.00 | 0.04 | 0.13 | 0.26 | 0.42 | 0.52 | 0.59 | 0.66 | 0.70 | 0.72 | 0.73 | 0.74 | 0.74 | 0.74 | 0.74 |
| 1994 | 0.00 | 0.06 | 0.26 | 0.49 | 0.71 | 0.88 | 1.00 | 1.05 | 1.10 | 1.12 | 1.14 | 1.15 | 1.15 | 1.16 | 1.16 |
| 1995 | 0.01 | 0.16 | 0.52 | 1.04 | 1.35 | 1.56 | 1.82 | 1.95 | 2.01 | 2.06 | 2.06 | 2.11 | 2.11 | 2.11 | 2.11 |
| 1996 | 0.00 | 0.05 | 0.19 | 0.48 | 0.70 | 0.92 | 1.06 | 1.11 | 1.18 | 1.20 | 1.21 | 1.22 | 1.22 | 1.22 | 1.22 |
| 1997 | 0.00 | 0.15 | 0.30 | 0.61 | 0.85 | 0.98 | 1.06 | 1.12 | 1.19 | 1.21 | 1.22 | 1.22 | 1.23 | 1.23 | **1.23** |
| 1998 | 0.00 | 0.01 | 0.14 | 0.28 | 0.46 | 0.53 | 0.59 | 0.65 | 0.65 | 0.66 | 0.67 | 0.68 | 0.70 | **0.70** | **0.72** |
| 1999 | 0.00 | 0.03 | 0.11 | 0.19 | 0.33 | 0.41 | 0.46 | 0.49 | 0.51 | 0.51 | 0.54 | 0.57 | **0.58** | **0.61** | **0.62** |
| 2000 | 0.00 | 0.08 | 0.20 | 0.40 | 0.55 | 0.63 | 0.70 | 0.78 | 0.85 | 0.94 | 1.01 | **1.02** | **1.06** | **1.08** | **1.09** |
| 2001 | 0.00 | 0.05 | 0.14 | 0.27 | 0.51 | 0.62 | 0.67 | 0.70 | 0.77 | 0.86 | **0.92** | **0.97** | **0.99** | **1.00** | **1.01** |
| 2002 | 0.00 | 0.04 | 0.23 | 0.34 | 0.44 | 0.50 | 0.56 | 0.61 | 0.65 | **0.70** | **0.76** | **0.79** | **0.82** | **0.83** | **0.83** |
| 2003 | 0.00 | 0.04 | 0.16 | 0.28 | 0.34 | 0.44 | 0.52 | 0.67 | **0.75** | **0.86** | **0.92** | **0.96** | **0.98** | **0.99** | **0.99** |
| 2004 | 0.02 | 0.10 | 0.26 | 0.38 | 0.49 | 0.65 | 0.88 | **1.02** | **1.20** | **1.29** | **1.36** | **1.39** | **1.41** | **1.42** | **1.43** |
| 2005 | 0.01 | 0.12 | 0.23 | 0.41 | 0.73 | 1.11 | **1.29** | **1.62** | **1.80** | **1.93** | **1.99** | **2.02** | **2.05** | **2.06** | **2.07** |
| 2006 | 0.00 | 0.05 | 0.14 | 0.59 | 1.13 | **1.37** | **1.80** | **2.09** | **2.31** | **2.42** | **2.47** | **2.51** | **2.53** | **2.54** | **2.55** |
| 2007 | 0.00 | 0.14 | 0.22 | 1.10 | **1.57** | **2.70** | **3.43** | **3.94** | **4.16** | **4.28** | **4.35** | **4.40** | **4.43** | **4.45** | **4.46** |
| 2008 | 0.00 | 0.10 | 0.68 | **1.48** | **2.94** | **3.79** | **4.34** | **4.61** | **4.76** | **4.85** | **4.91** | **4.94** | **4.97** | **4.99** | **5.00** |
| 2009 | 0.00 | 0.09 | **0.35** | **1.14** | **1.76** | **2.20** | **2.44** | **2.58** | **2.68** | **2.74** | **2.78** | **2.81** | **2.83** | **2.84** | **2.85** |
| 2010 | 0.00 | **0.10** | **0.56** | **1.08** | **1.53** | **1.78** | **1.94** | **2.05** | **2.12** | **2.16** | **2.20** | **2.22** | **2.23** | **2.24** | **2.25** |
| 2011 | **0.01** | **0.11** | **0.31** | **0.57** | **0.75** | **0.88** | **0.97** | **1.04** | **1.09** | **1.12** | **1.14** | **1.15** | **1.16** | **1.17** | **1.17** |
| 2012 | **0.01** | **0.11** | **0.29** | **0.48** | **0.64** | **0.76** | **0.86** | **0.93** | **0.98** | **1.01** | **1.04** | **1.05** | **1.07** | **1.07** | **1.08** |
| 2013 | **0.01** | **0.09** | **0.24** | **0.46** | **0.67** | **0.85** | **0.99** | **1.10** | **1.18** | **1.24** | **1.28** | **1.31** | **1.33** | **1.35** | **1.36** |
| 2014 | **0.00** | **0.06** | **0.20** | **0.41** | **0.62** | **0.80** | **0.95** | **1.06** | **1.15** | **1.21** | **1.25** | **1.28** | **1.30** | **1.32** | **1.32** |
| 2015 | **0.01** | **0.07** | **0.20** | **0.38** | **0.56** | **0.71** | **0.84** | **0.94** | **1.01** | **1.06** | **1.10** | **1.12** | **1.14** | **1.15** | **1.15** |
| 2016 | **0.01** | **0.07** | **0.20** | **0.38** | **0.56** | **0.72** | **0.84** | **0.94** | **1.02** | **1.08** | **1.11** | **1.14** | **1.16** | **1.17** | **1.17** |
| 2017 | **0.01** | **0.07** | **0.20** | **0.39** | **0.57** | **0.74** | **0.87** | **0.97** | **1.05** | **1.10** | **1.14** | **1.17** | **1.18** | **1.20** | **1.20** |
| 2018 | **0.01** | **0.07** | **0.20** | **0.38** | **0.57** | **0.73** | **0.85** | **0.95** | **1.02** | **1.07** | **1.11** | **1.13** | **1.15** | **1.16** | **1.17** |

**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 | 0.58 | 9.40 | 25.07 | 30.74 | 38.71 | 45.07 | 53.55 | 61.72 | 65.94 | 70.81 | 77.12 | 82.84 | 86.45 | 89.34 | 92.37 |
| 1993 | 1.01 | 7.33 | 12.71 | 20.70 | 28.10 | 37.74 | 47.92 | 53.66 | 60.11 | 67.63 | 76.27 | 81.25 | 84.80 | 88.09 | 92.11 |
| 1994 | 1.36 | 5.33 | 12.03 | 18.77 | 27.77 | 37.71 | 43.78 | 50.81 | 58.96 | 68.54 | 74.74 | 79.25 | 83.19 | 86.46 | 93.36 |
| 1995 | 1.94 | 11.10 | 18.60 | 29.17 | 41.12 | 46.94 | 53.42 | 61.79 | 70.06 | 75.34 | 78.97 | 81.87 | 84.83 | 86.87 | 92.37 |
| 1996 | 0.81 | 5.10 | 14.01 | 25.91 | 32.85 | 41.37 | 51.98 | 64.78 | 72.45 | 77.06 | 80.89 | 83.49 | 85.98 | 88.58 | 92.74 |
| 1997 | 1.22 | 9.82 | 22.61 | 29.15 | 36.93 | 49.00 | 62.62 | 70.71 | 75.90 | 79.88 | 82.82 | 84.87 | 86.97 | 89.14 | **91.41** |
| 1998 | 1.03 | 7.77 | 13.62 | 22.28 | 34.82 | 54.46 | 64.92 | 70.77 | 75.32 | 78.52 | 81.32 | 83.55 | 85.81 | **88.33** | **92.66** |
| 1999 | 1.16 | 5.15 | 13.02 | 24.99 | 44.55 | 56.17 | 63.30 | 68.52 | 72.16 | 75.08 | 77.66 | 80.04 | **82.95** | **88.00** | **92.61** |
| 2000 | 2.18 | 13.99 | 29.06 | 48.87 | 61.80 | 68.54 | 73.43 | 76.24 | 78.43 | 80.50 | 82.51 | **84.02** | **87.55** | **91.10** | **94.50** |
| 2001 | 1.25 | 13.44 | 45.04 | 60.86 | 69.20 | 73.52 | 76.66 | 79.14 | 80.91 | 82.51 | **83.87** | **86.03** | **88.73** | **91.27** | **93.54** |
| 2002 | 2.35 | 24.46 | 40.44 | 51.63 | 58.24 | 62.87 | 66.25 | 69.12 | 71.67 | **73.83** | **76.60** | **79.93** | **83.08** | **86.18** | **89.76** |
| 2003 | 4.64 | 15.90 | 28.95 | 38.11 | 44.54 | 49.26 | 53.19 | 56.70 | **60.11** | **64.54** | **68.11** | **71.23** | **74.80** | **79.42** | **84.83** |
| 2004 | 4.62 | 14.96 | 24.37 | 31.35 | 36.29 | 40.32 | 44.03 | **48.01** | **53.90** | **58.29** | **61.23** | **64.73** | **69.51** | **75.56** | **81.62** |
| 2005 | 4.31 | 12.29 | 19.76 | 24.96 | 28.75 | 32.54 | **36.28** | **41.46** | **45.40** | **47.69** | **49.55** | **52.13** | **55.83** | **60.85** | **66.73** |
| 2006 | 2.61 | 10.16 | 16.69 | 22.56 | 27.17 | **30.79** | **35.90** | **39.95** | **42.42** | **44.10** | **45.65** | **47.83** | **51.03** | **55.57** | **62.06** |
| 2007 | 1.06 | 10.04 | 20.33 | 27.23 | **31.31** | **36.62** | **41.01** | **43.83** | **45.75** | **47.44** | **49.01** | **51.18** | **54.37** | **59.29** | **65.99** |
| 2008 | 1.28 | 9.85 | 17.38 | **22.43** | **28.58** | **33.85** | **37.22** | **39.74** | **41.95** | **43.89** | **45.67** | **48.10** | **51.73** | **56.87** | **63.59** |
| 2009 | 0.81 | 6.70 | **13.07** | **19.46** | **25.31** | **29.70** | **33.33** | **36.51** | **39.29** | **41.70** | **43.89** | **46.80** | **51.05** | **56.98** | **64.74** |
| 2010 | 1.49 | **6.37** | **11.77** | **18.01** | **23.06** | **27.34** | **31.17** | **34.51** | **37.41** | **39.93** | **42.47** | **46.10** | **51.33** | **58.47** | **67.50** |
| 2011 | **0.70** | **4.19** | **9.70** | **16.12** | **21.58** | **26.44** | **30.68** | **34.33** | **37.48** | **40.22** | **42.96** | **46.88** | **52.47** | **60.03** | **69.40** |
| 2012 | **2.32** | **6.42** | **11.89** | **18.22** | **24.01** | **29.04** | **33.39** | **37.13** | **40.39** | **43.21** | **46.11** | **50.20** | **55.91** | **63.41** | **72.34** |
| 2013 | **2.36** | **7.23** | **14.58** | **23.71** | **31.65** | **38.39** | **44.19** | **49.07** | **53.34** | **56.97** | **60.36** | **64.93** | **70.92** | **77.98** | **85.47** |
| 2014 | **1.64** | **5.71** | **11.72** | **19.64** | **27.07** | **33.81** | **39.57** | **44.72** | **49.13** | **52.82** | **56.13** | **60.47** | **66.32** | **73.43** | **81.86** |
| 2015 | **1.77** | **5.56** | **11.08** | **18.44** | **25.41** | **31.70** | **37.28** | **42.01** | **45.97** | **49.30** | **52.41** | **56.62** | **62.32** | **70.24** | **79.37** |
| 2016 | **1.85** | **5.60** | **11.30** | **19.10** | **26.37** | **32.87** | **38.76** | **43.62** | **47.67** | **51.06** | **54.18** | **58.27** | **64.16** | **71.91** | **80.46** |
| 2017 | **1.79** | **5.56** | **11.56** | **19.72** | **27.62** | **34.60** | **40.44** | **45.26** | **49.25** | **52.55** | **55.60** | **59.97** | **66.10** | **73.60** | **81.76** |
| 2018 | **1.75** | **5.56** | **11.62** | **19.91** | **27.54** | **33.91** | **39.25** | **43.65** | **47.33** | **50.38** | **53.51** | **58.03** | **64.16** | **71.83** | **80.31** |

**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 | 0.62 | 1.04 | 1.40 | 1.63 | 2.25 | 2.42 | 1.88 | 1.57 | 0.91 | 0.43 | 0.45 | 0.50 | 0.13 | 0.15 | 0.15 | 0.07 | 0.24 | 0.29 | **0.09** | **0.18** | **0.12** | **0.14** | **0.12** | **0.11** | **0.10** | **0.09** | **0.07** | **0.05** |
| 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 | **0.15** | **0.36** | **0.19** | **0.22** | **0.19** | **0.17** | **0.15** | **0.13** | **0.11** | **0.09** | **0.07** |
| 1993 | 0.00 | 0.15 | 0.72 | 1.38 | 2.65 | 2.47 | 2.19 | 1.78 | 1.06 | 0.74 | 0.75 | 0.47 | 0.28 | 0.27 | 0.24 | 0.23 | 0.33 | 0.51 | **0.18** | **0.41** | **0.24** | **0.27** | **0.23** | **0.21** | **0.19** | **0.17** | **0.14** | **0.12** | **0.10** | **0.07** |
| 1994 | 0.00 | 0.17 | 0.92 | 2.15 | 2.74 | 2.64 | 1.98 | 1.10 | 0.91 | 0.93 | 0.69 | 0.37 | 0.37 | 0.22 | 0.25 | 0.31 | 0.49 | **0.33** | **0.48** | **0.32** | **0.36** | **0.31** | **0.29** | **0.26** | **0.23** | **0.20** | **0.18** | **0.15** | **0.12** | **0.10** |
| 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 | **0.53** | **0.82** | **0.41** | **0.47** | **0.39** | **0.36** | **0.33** | **0.29** | **0.26** | **0.22** | **0.19** | **0.16** | **0.13** | **0.09** |
| 1996 | 0.00 | 0.33 | 1.75 | 3.78 | 3.96 | 2.71 | 2.78 | 3.18 | 2.13 | 1.36 | 1.09 | 0.70 | 1.23 | 1.17 | 1.22 | **0.82** | **1.23** | **0.81** | **0.94** | **0.78** | **0.71** | **0.64** | **0.57** | **0.49** | **0.42** | **0.35** | **0.29** | **0.24** | **0.19** | **0.15** |
| 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 | 1.63 | **0.93** | **1.38** | **0.86** | **1.01** | **0.84** | **0.77** | **0.70** | **0.62** | **0.54** | **0.46** | **0.39** | **0.32** | **0.27** | **0.22** | **0.18** | **0.14** |
| 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 | **0.97** | **1.65** | **1.06** | **1.23** | **1.02** | **0.94** | **0.85** | **0.76** | **0.67** | **0.57** | **0.48** | **0.40** | **0.33** | **0.28** | **0.23** | **0.18** | **0.14** |
| 1999 | 0.00 | 0.23 | 0.84 | 1.99 | 3.18 | 2.83 | 1.77 | 1.56 | 1.63 | 1.34 | 2.65 | 2.65 | **1.23** | **2.03** | **1.22** | **1.38** | **1.13** | **1.05** | **0.96** | **0.87** | **0.77** | **0.67** | **0.57** | **0.48** | **0.41** | **0.34** | **0.29** | **0.24** | **0.20** | **0.15** |
| 2000 | 0.01 | 0.51 | 1.68 | 3.26 | 2.99 | 2.36 | 1.99 | 2.15 | 2.82 | 3.41 | 2.99 | **1.88** | **2.54** | **1.45** | **1.60** | **1.30** | **1.20** | **1.09** | **0.99** | **0.89** | **0.78** | **0.67** | **0.57** | **0.48** | **0.41** | **0.34** | **0.29** | **0.24** | **0.19** | **0.13** |
| 2001 | 0.00 | 0.33 | 1.25 | 1.87 | 1.47 | 2.12 | 2.04 | 2.85 | 3.78 | 3.65 | **2.47** | **3.21** | **1.70** | **1.68** | **1.32** | **1.19** | **1.09** | **1.00** | **0.90** | **0.80** | **0.70** | **0.60** | **0.52** | **0.45** | **0.38** | **0.33** | **0.27** | **0.22** | **0.16** | **0.12** |
| 2002 | 0.00 | 0.23 | 1.45 | 1.85 | 2.19 | 2.85 | 4.61 | 5.24 | 4.98 | **2.95** | **4.60** | **2.60** | **2.47** | **1.74** | **1.55** | **1.39** | **1.27** | **1.16** | **1.04** | **0.91** | **0.80** | **0.69** | **0.60** | **0.52** | **0.45** | **0.38** | **0.31** | **0.23** | **0.18** | **0.14** |
| 2003 | 0.01 | 0.54 | 1.48 | 2.13 | 3.56 | 5.36 | 5.73 | 6.10 | **3.26** | **5.47** | **3.37** | **3.12** | **2.14** | **1.84** | **1.65** | **1.50** | **1.37** | **1.23** | **1.09** | **0.96** | **0.84** | **0.73** | **0.63** | **0.55** | **0.47** | **0.38** | **0.29** | **0.23** | **0.19** | **0.14** |
| 2004 | 0.08 | 0.64 | 1.61 | 3.05 | 5.53 | 6.26 | 5.74 | **3.98** | **7.06** | **4.46** | **3.96** | **2.69** | **2.16** | **1.90** | **1.72** | **1.56** | **1.41** | **1.26** | **1.11** | **0.98** | **0.86** | **0.75** | **0.65** | **0.56** | **0.46** | **0.35** | **0.28** | **0.23** | **0.19** | **0.14** |
| 2005 | 0.09 | 0.86 | 2.43 | 5.05 | 6.42 | 6.88 | **4.38** | **8.98** | **5.98** | **5.13** | **3.27** | **2.46** | **1.98** | **1.72** | **1.51** | **1.33** | **1.17** | **1.03** | **0.90** | **0.79** | **0.68** | **0.59** | **0.51** | **0.42** | **0.33** | **0.27** | **0.22** | **0.18** | **0.15** | **0.11** |
| 2006 | 0.02 | 1.12 | 3.46 | 6.96 | 8.91 | **6.44** | **11.21** | **8.25** | **7.09** | **4.42** | **3.30** | **2.56** | **2.12** | **1.79** | **1.55** | **1.34** | **1.16** | **1.01** | **0.88** | **0.77** | **0.66** | **0.57** | **0.48** | **0.37** | **0.31** | **0.26** | **0.21** | **0.18** | **0.14** | **0.11** |
| 2007 | 0.00 | 1.02 | 4.98 | 9.65 | **7.66** | **14.54** | **11.73** | **9.77** | **6.10** | **4.58** | **3.51** | **2.77** | **2.29** | **1.94** | **1.66** | **1.43** | **1.24** | **1.07** | **0.93** | **0.80** | **0.69** | **0.58** | **0.46** | **0.38** | **0.31** | **0.26** | **0.22** | **0.18** | **0.15** | **0.11** |
| 2008 | 0.01 | 0.57 | 4.02 | **6.62** | **13.98** | **11.07** | **9.14** | **5.67** | **4.10** | **2.99** | **2.34** | **1.93** | **1.64** | **1.42** | **1.24** | **1.08** | **0.96** | **0.85** | **0.75** | **0.66** | **0.57** | **0.46** | **0.38** | **0.32** | **0.27** | **0.22** | **0.19** | **0.16** | **0.13** | **0.10** |
| 2009 | 0.09 | 0.93 | **2.49** | **7.09** | **6.05** | **5.19** | **3.38** | **2.57** | **2.00** | **1.65** | **1.39** | **1.22** | **1.09** | **0.96** | **0.87** | **0.79** | **0.71** | **0.64** | **0.57** | **0.50** | **0.42** | **0.34** | **0.29** | **0.25** | **0.21** | **0.17** | **0.15** | **0.12** | **0.10** | **0.08** |
| 2010 | 0.01 | **0.28** | **2.29** | **3.07** | **3.10** | **2.25** | **1.95** | **1.64** | **1.42** | **1.23** | **1.07** | **0.98** | **0.90** | **0.83** | **0.77** | **0.72** | **0.66** | **0.60** | **0.56** | **0.49** | **0.43** | **0.37** | **0.33** | **0.29** | **0.25** | **0.22** | **0.19** | **0.17** | **0.14** | **0.12** |
| 2011 | **0.08** | **0.81** | **1.90** | **2.50** | **2.04** | **1.89** | **1.73** | **1.53** | **1.33** | **1.18** | **1.07** | **0.97** | **0.90** | **0.83** | **0.77** | **0.71** | **0.65** | **0.60** | **0.53** | **0.46** | **0.40** | **0.34** | **0.30** | **0.26** | **0.23** | **0.20** | **0.17** | **0.14** | **0.12** | **0.09** |
| 2012 | **0.02** | **0.33** | **1.30** | **1.58** | **1.70** | **1.69** | **1.63** | **1.50** | **1.35** | **1.22** | **1.08** | **0.99** | **0.91** | **0.83** | **0.76** | **0.69** | **0.63** | **0.54** | **0.45** | **0.38** | **0.32** | **0.27** | **0.23** | **0.19** | **0.16** | **0.13** | **0.11** | **0.09** | **0.08** | **0.06** |
| 2013 | **0.01** | **0.34** | **1.07** | **1.65** | **1.88** | **1.88** | **1.82** | **1.67** | **1.50** | **1.33** | **1.17** | **1.07** | **0.99** | **0.90** | **0.82** | **0.76** | **0.67** | **0.56** | **0.48** | **0.41** | **0.35** | **0.29** | **0.25** | **0.21** | **0.17** | **0.14** | **0.12** | **0.10** | **0.08** | **0.06** |
| 2014 | **0.01** | **0.30** | **1.13** | **1.78** | **2.10** | **2.14** | **2.08** | **1.88** | **1.66** | **1.45** | **1.28** | **1.16** | **1.06** | **0.97** | **0.91** | **0.80** | **0.68** | **0.58** | **0.50** | **0.43** | **0.36** | **0.31** | **0.26** | **0.22** | **0.18** | **0.15** | **0.13** | **0.10** | **0.09** | **0.07** |
| 2015 | **0.01** | **0.34** | **1.27** | **2.00** | **2.33** | **2.40** | **2.31** | **2.06** | **1.78** | **1.54** | **1.34** | **1.22** | **1.12** | **1.05** | **0.93** | **0.80** | **0.69** | **0.59** | **0.51** | **0.44** | **0.37** | **0.31** | **0.26** | **0.22** | **0.18** | **0.16** | **0.13** | **0.11** | **0.09** | **0.07** |
| 2016 | **0.01** | **0.36** | **1.34** | **2.08** | **2.40** | **2.43** | **2.31** | **2.06** | **1.77** | **1.51** | **1.32** | **1.20** | **1.14** | **1.03** | **0.89** | **0.77** | **0.67** | **0.58** | **0.50** | **0.43** | **0.36** | **0.31** | **0.26** | **0.22** | **0.18** | **0.15** | **0.13** | **0.11** | **0.09** | **0.07** |
| 2017 | **0.01** | **0.38** | **1.43** | **2.20** | **2.48** | **2.47** | **2.34** | **2.10** | **1.77** | **1.51** | **1.32** | **1.24** | **1.13** | **0.98** | **0.86** | **0.76** | **0.66** | **0.58** | **0.50** | **0.43** | **0.36** | **0.31** | **0.26** | **0.22** | **0.19** | **0.16** | **0.13** | **0.11** | **0.09** | **0.07** |
| 2018 | **0.01** | **0.39** | **1.46** | **2.25** | **2.51** | **2.48** | **2.35** | **2.09** | **1.73** | **1.49** | **1.36** | **1.24** | **1.08** | **0.95** | **0.84** | **0.74** | **0.65** | **0.57** | **0.49** | **0.42** | **0.36** | **0.31** | **0.26** | **0.22** | **0.19** | **0.16** | **0.13** | **0.11** | **0.09** | **0.07** |

**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 | 7.03 | 11.55 | 11.49 | 17.17 | 18.69 | 12.78 | 21.84 | 24.92 | 25.96 | 21.47 | 16.47 | 21.40 | 13.81 | 8.52 | 7.27 | 3.68 | **3.01** | **6.89** | **5.73** | **4.88** | **6.30** | **5.79** | **5.29** | **4.88** | **4.39** | **3.69** |
| 1992 | 0.22 | 3.13 | 6.81 | 7.04 | 13.14 | 11.87 | 19.87 | 20.19 | 13.09 | 21.72 | 24.22 | 27.16 | 22.20 | 17.38 | 17.08 | 14.44 | 10.52 | 5.70 | 4.93 | **3.37** | **7.23** | **6.02** | **5.14** | **6.63** | **6.11** | **5.60** | **5.22** | **4.79** | **4.27** | **3.51** |
| 1993 | 0.44 | 3.41 | 5.29 | 12.90 | 10.95 | 19.63 | 20.41 | 12.81 | 25.05 | 27.29 | 30.04 | 25.31 | 20.54 | 17.43 | 16.37 | 10.50 | 6.33 | 4.88 | **3.56** | **7.65** | **6.38** | **5.45** | **7.02** | **6.48** | **5.96** | **5.57** | **5.16** | **4.72** | **4.19** | **3.43** |
| 1994 | 0.29 | 2.47 | 9.91 | 11.37 | 21.38 | 20.46 | 12.98 | 25.50 | 27.02 | 31.13 | 26.68 | 21.81 | 19.45 | 16.57 | 11.19 | 5.05 | 4.32 | **3.11** | **7.97** | **6.66** | **5.69** | **7.33** | **6.77** | **6.23** | **5.84** | **5.43** | **5.01** | **4.55** | **4.03** | **3.29** |
| 1995 | 1.70 | 10.18 | 15.64 | 31.41 | 23.16 | 13.52 | 25.48 | 26.47 | 28.53 | 26.77 | 23.73 | 21.46 | 17.73 | 10.26 | 5.17 | 3.68 | **2.74** | **7.85** | **6.58** | **5.61** | **7.21** | **6.65** | **6.13** | **5.75** | **5.36** | **4.97** | **4.55** | **4.13** | **3.65** | **2.97** |
| 1996 | 0.48 | 6.04 | 34.07 | 32.32 | 15.77 | 30.25 | 27.37 | 27.66 | 26.98 | 23.48 | 21.47 | 18.87 | 11.59 | 5.39 | 3.84 | **2.96** | **9.72** | **8.18** | **6.96** | **8.88** | **8.18** | **7.53** | **7.05** | **6.57** | **6.09** | **5.61** | **5.13** | **4.64** | **4.11** | **3.37** |
| 1997 | 0.93 | 18.34 | 34.35 | 18.60 | 36.90 | 27.37 | 27.57 | 25.70 | 23.18 | 21.82 | 19.12 | 12.30 | 5.61 | 3.91 | **3.25** | **10.32** | **8.73** | **7.42** | **9.45** | **8.71** | **8.01** | **7.50** | **7.00** | **6.49** | **5.99** | **5.50** | **5.03** | **4.56** | **4.04** | **3.31** |
| 1998 | 2.82 | 20.59 | 17.24 | 36.96 | 28.93 | 28.02 | 27.17 | 25.10 | 23.40 | 22.13 | 13.72 | 6.95 | 3.88 | **3.54** | **10.55** | **8.99** | **7.64** | **9.72** | **8.95** | **8.23** | **7.70** | **7.18** | **6.66** | **6.15** | **5.66** | **5.20** | **4.75** | **4.29** | **3.76** | **2.96** |
| 1999 | 0.39 | 3.97 | 32.47 | 31.25 | 30.30 | 25.76 | 27.74 | 26.94 | 26.73 | 17.06 | 7.14 | 4.39 | **3.98** | **11.65** | **9.98** | **8.62** | **11.00** | **10.13** | **9.32** | **8.73** | **8.14** | **7.56** | **6.98** | **6.44** | **5.94** | **5.46** | **5.00** | **4.54** | **4.05** | **2.90** |
| 2000 | 1.06 | 33.05 | 31.03 | 29.23 | 24.67 | 26.80 | 26.16 | 26.30 | 16.94 | 6.52 | 4.49 | **3.25** | **11.72** | **10.31** | **8.91** | **11.43** | **10.55** | **9.70** | **9.08** | **8.47** | **7.87** | **7.27** | **6.71** | **6.19** | **5.70** | **5.24** | **4.80** | **4.34** | **3.22** | **2.02** |
| 2001 | 4.96 | 20.07 | 29.66 | 26.01 | 31.51 | 30.73 | 30.47 | 17.95 | 8.34 | 4.93 | **3.53** | **11.97** | **10.78** | **9.90** | **12.79** | **11.94** | **11.03** | **10.34** | **9.66** | **8.98** | **8.30** | **7.66** | **7.08** | **6.53** | **6.02** | **5.54** | **5.07** | **3.83** | **2.65** | **2.21** |
| 2002 | 2.34 | 27.54 | 23.93 | 31.05 | 31.79 | 33.08 | 19.79 | 7.18 | 4.65 | **3.06** | **10.81** | **9.98** | **9.54** | **13.06** | **12.26** | **11.50** | **10.81** | **10.09** | **9.38** | **8.68** | **8.01** | **7.41** | **6.84** | **6.31** | **5.82** | **5.35** | **4.05** | **2.87** | **2.55** | **2.11** |
| 2003 | 8.03 | 22.24 | 33.97 | 35.38 | 34.75 | 20.56 | 7.15 | 4.11 | **3.16** | **10.19** | **9.55** | **9.22** | **13.10** | **12.49** | **11.66** | **11.03** | **10.30** | **9.58** | **8.86** | **8.19** | **7.57** | **6.99** | **6.46** | **5.96** | **5.49** | **4.17** | **2.98** | **2.70** | **2.38** | **1.90** |
| 2004 | 6.57 | 29.79 | 34.47 | 34.28 | 19.55 | 7.28 | 4.08 | **2.83** | **9.24** | **8.69** | **8.73** | **12.45** | **12.49** | **11.79** | **11.20** | **10.53** | **9.80** | **9.07** | **8.38** | **7.74** | **7.15** | **6.60** | **6.09** | **5.61** | **4.26** | **3.07** | **2.80** | **2.52** | **2.21** | **1.69** |
| 2005 | 9.17 | 22.05 | 25.69 | 19.12 | 7.00 | 3.64 | **1.96** | **6.11** | **5.77** | **6.17** | **9.29** | **9.69** | **9.52** | **9.18** | **8.69** | **8.13** | **7.53** | **6.95** | **6.42** | **5.93** | **5.48** | **5.05** | **4.65** | **3.54** | **2.56** | **2.35** | **2.15** | **1.94** | **1.70** | **1.33** |
| 2006 | 2.39 | 12.75 | 17.84 | 14.60 | 5.54 | **2.31** | **5.12** | **4.83** | **5.31** | **8.34** | **8.87** | **9.12** | **9.03** | **8.76** | **8.30** | **7.76** | **7.23** | **6.72** | **6.25** | **5.79** | **5.36** | **4.94** | **3.76** | **2.73** | **2.52** | **2.33** | **2.13** | **1.93** | **1.71** | **1.38** |
| 2007 | 1.59 | 11.62 | 19.30 | 12.08 | **3.23** | **4.43** | **4.18** | **4.80** | **7.77** | **8.36** | **8.85** | **9.01** | **8.79** | **8.39** | **7.90** | **7.36** | **6.88** | **6.42** | **5.96** | **5.54** | **5.14** | **3.92** | **2.86** | **2.65** | **2.46** | **2.27** | **2.09** | **1.89** | **1.68** | **1.37** |
| 2008 | 0.56 | 25.20 | 19.79 | **9.46** | **5.87** | **5.33** | **6.11** | **9.84** | **10.65** | **11.28** | **11.47** | **11.32** | **10.98** | **10.40** | **9.82** | **9.20** | **8.52** | **7.88** | **7.27** | **6.72** | **5.12** | **3.74** | **3.47** | **3.22** | **2.98** | **2.76** | **2.53** | **2.30** | **2.06** | **1.74** |
| 2009 | 12.77 | 19.89 | **13.48** | **10.50** | **8.74** | **9.14** | **13.98** | **14.64** | **14.79** | **14.60** | **14.32** | **13.73** | **12.90** | **12.09** | **11.21** | **10.33** | **9.53** | **8.78** | **8.12** | **6.19** | **4.53** | **4.21** | **3.90** | **3.61** | **3.36** | **3.10** | **2.85** | **2.59** | **2.30** | **1.92** |
| 2010 | 2.29 | **7.03** | **13.68** | **12.12** | **11.44** | **16.54** | **17.03** | **16.91** | **16.65** | **16.10** | **15.58** | **14.56** | **13.55** | **12.54** | **11.56** | **10.65** | **9.82** | **9.07** | **6.92** | **5.07** | **4.71** | **4.37** | **4.05** | **3.76** | **3.49** | **3.22** | **2.95** | **2.67** | **2.36** | **1.94** |
| 2011 | **1.23** | **14.91** | **15.93** | **15.08** | **19.28** | **19.03** | **18.57** | **18.17** | **17.60** | **16.74** | **15.59** | **14.54** | **13.46** | **12.42** | **11.43** | **10.53** | **9.72** | **7.41** | **5.44** | **5.05** | **4.69** | **4.35** | **4.03** | **3.75** | **3.47** | **3.20** | **2.94** | **2.66** | **2.34** | **1.90** |
| 2012 | **5.09** | **16.18** | **19.40** | **24.97** | **22.06** | **20.74** | **20.06** | **19.13** | **18.03** | **16.82** | **15.80** | **14.65** | **13.56** | **12.51** | **11.55** | **10.68** | **8.16** | **6.00** | **5.57** | **5.19** | **4.81** | **4.47** | **4.15** | **3.87** | **3.58** | **3.30** | **3.03** | **2.74** | **2.42** | **1.97** |
| 2013 | **3.96** | **17.71** | **27.46** | **25.51** | **21.29** | **20.27** | **19.44** | **18.44** | **17.36** | **16.29** | **15.32** | **14.16** | **13.09** | **12.08** | **11.15** | **8.52** | **6.27** | **5.82** | **5.40** | **5.02** | **4.66** | **4.33** | **4.02** | **3.74** | **3.47** | **3.19** | **2.93** | **2.65** | **2.34** | **1.91** |
| 2014 | **4.36** | **22.06** | **25.56** | **23.62** | **19.92** | **18.76** | **18.13** | **17.31** | **16.40** | **15.59** | **14.66** | **13.56** | **12.52** | **11.54** | **8.82** | **6.49** | **6.02** | **5.58** | **5.17** | **4.80** | **4.47** | **4.14** | **3.84** | **3.57** | **3.32** | **3.05** | **2.79** | **2.53** | **2.23** | **1.84** |
| 2015 | **5.34** | **21.39** | **24.13** | **22.24** | **18.72** | **17.36** | **16.75** | **16.13** | **15.54** | **14.83** | **13.96** | **12.90** | **11.89** | **9.09** | **6.69** | **6.19** | **5.74** | **5.32** | **4.93** | **4.57** | **4.25** | **3.93** | **3.64** | **3.39** | **3.14** | **2.88** | **2.63** | **2.38** | **2.11** | **1.74** |
| 2016 | **5.56** | **21.00** | **23.47** | **21.61** | **18.24** | **17.06** | **16.53** | **15.97** | **15.57** | **14.91** | **14.05** | **12.98** | **9.94** | **7.33** | **6.78** | **6.28** | **5.82** | **5.39** | **4.99** | **4.63** | **4.29** | **3.97** | **3.68** | **3.42** | **3.16** | **2.89** | **2.64** | **2.40** | **2.13** | **1.75** |
| 2017 | **5.23** | **20.26** | **22.51** | **20.62** | **17.59** | **16.66** | **16.28** | **15.81** | **15.70** | **15.08** | **14.22** | **10.94** | **8.10** | **7.50** | **6.94** | **6.43** | **5.95** | **5.51** | **5.10** | **4.73** | **4.38** | **4.05** | **3.75** | **3.49** | **3.21** | **2.94** | **2.70** | **2.45** | **2.17** | **1.78** |
| 2018 | **5.24** | **20.02** | **21.98** | **19.99** | **17.16** | **16.48** | **16.18** | **15.83** | **15.88** | **15.15** | **11.90** | **8.87** | **8.24** | **7.62** | **7.05** | **6.53** | **6.05** | **5.59** | **5.18** | **4.80** | **4.44** | **4.10** | **3.79** | **3.52** | **3.23** | **2.98** | **2.73** | **2.48** | **2.20** | **1.81** |

**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 | **8.90** | **8.91** | **8.92** | **8.92** | **8.93** | **8.93** | **8.94** | **8.94** | **8.94** | **8.94** |
| 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** | **8.33** | **8.34** | **8.34** | **8.35** | **8.36** | **8.36** | **8.36** | **8.37** | **8.37** |
| 1993 | 0.00 | 0.16 | 0.85 | 2.10 | 4.15 | 5.81 | 6.95 | 7.67 | 8.03 | 8.22 | 8.36 | 8.42 | 8.44 | 8.46 | 8.48 | 8.49 | 8.50 | 8.52 | **8.53** | **8.55** | **8.56** | **8.57** | **8.57** | **8.58** | **8.58** | **8.59** | **8.59** | **8.60** | **8.60** | **8.60** |
| 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** | **8.45** | **8.46** | **8.47** | **8.48** | **8.49** | **8.49** | **8.50** | **8.50** | **8.51** | **8.51** | **8.51** | **8.52** |
| 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 | **9.00** | **9.02** | **9.03** | **9.04** | **9.05** | **9.06** | **9.06** | **9.07** | **9.07** | **9.08** | **9.08** | **9.08** | **9.09** | **9.09** |
| 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 | **8.12** | **8.15** | **8.16** | **8.18** | **8.20** | **8.21** | **8.22** | **8.23** | **8.23** | **8.24** | **8.24** | **8.24** | **8.25** | **8.25** | **8.25** |
| 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 | **7.13** | **7.17** | **7.19** | **7.21** | **7.23** | **7.24** | **7.25** | **7.26** | **7.27** | **7.27** | **7.28** | **7.28** | **7.28** | **7.29** | **7.29** | **7.29** |
| 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 | **7.22** | **7.28** | **7.32** | **7.35** | **7.38** | **7.40** | **7.42** | **7.43** | **7.44** | **7.45** | **7.46** | **7.46** | **7.47** | **7.47** | **7.47** | **7.48** | **7.48** |
| 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 | **5.65** | **5.75** | **5.80** | **5.85** | **5.88** | **5.91** | **5.94** | **5.96** | **5.97** | **5.98** | **5.99** | **6.00** | **6.01** | **6.01** | **6.02** | **6.02** | **6.02** | **6.02** |
| 2000 | 0.01 | 0.52 | 1.62 | 3.07 | 3.96 | 4.47 | 4.77 | 5.01 | 5.23 | 5.44 | 5.61 | **5.70** | **5.83** | **5.89** | **5.96** | **6.00** | **6.03** | **6.06** | **6.09** | **6.10** | **6.12** | **6.13** | **6.14** | **6.15** | **6.15** | **6.16** | **6.16** | **6.16** | **6.17** | **6.17** |
| 2001 | 0.00 | 0.32 | 1.27 | 2.25 | 2.80 | 3.34 | 3.68 | 4.00 | 4.34 | 4.63 | **4.81** | **5.03** | **5.13** | **5.22** | **5.28** | **5.32** | **5.36** | **5.39** | **5.41** | **5.43** | **5.44** | **5.45** | **5.46** | **5.47** | **5.48** | **5.48** | **5.49** | **5.49** | **5.49** | **5.49** |
| 2002 | 0.00 | 0.23 | 1.26 | 2.24 | 3.01 | 3.67 | 4.35 | 4.94 | 5.42 | **5.68** | **6.07** | **6.26** | **6.41** | **6.51** | **6.58** | **6.64** | **6.68** | **6.72** | **6.74** | **6.77** | **6.78** | **6.80** | **6.81** | **6.82** | **6.82** | **6.83** | **6.83** | **6.84** | **6.84** | **6.84** |
| 2003 | 0.01 | 0.51 | 1.57 | 2.54 | 3.56 | 4.50 | 5.24 | 5.93 | **6.26** | **6.79** | **7.06** | **7.29** | **7.42** | **7.51** | **7.59** | **7.65** | **7.69** | **7.73** | **7.76** | **7.78** | **7.80** | **7.81** | **7.83** | **7.83** | **7.84** | **7.85** | **7.85** | **7.86** | **7.86** | **7.86** |
| 2004 | 0.08 | 0.68 | 1.73 | 3.00 | 4.43 | 5.64 | 6.60 | **7.20** | **8.21** | **8.75** | **9.16** | **9.40** | **9.56** | **9.69** | **9.78** | **9.86** | **9.92** | **9.97** | **10.01** | **10.04** | **10.06** | **10.08** | **10.10** | **10.11** | **10.12** | **10.13** | **10.13** | **10.14** | **10.14** | **10.14** |
| 2005 | 0.09 | 0.87 | 2.57 | 5.11 | 7.56 | 9.83 | **11.13** | **13.66** | **15.08** | **16.16** | **16.77** | **17.16** | **17.45** | **17.66** | **17.83** | **17.97** | **18.07** | **18.16** | **18.23** | **18.29** | **18.33** | **18.37** | **18.40** | **18.42** | **18.44** | **18.45** | **18.47** | **18.47** | **18.48** | **18.49** |
| 2006 | 0.02 | 1.13 | 4.05 | 8.67 | 13.31 | **16.17** | **20.82** | **23.66** | **25.79** | **26.94** | **27.69** | **28.21** | **28.58** | **28.86** | **29.08** | **29.25** | **29.39** | **29.49** | **29.58** | **29.65** | **29.70** | **29.75** | **29.78** | **29.81** | **29.83** | **29.85** | **29.87** | **29.88** | **29.89** | **29.90** |
| 2007 | 0.00 | 1.02 | 5.33 | 11.64 | **15.56** | **22.28** | **26.65** | **29.71** | **31.33** | **32.39** | **33.09** | **33.57** | **33.92** | **34.19** | **34.39** | **34.55** | **34.68** | **34.78** | **34.86** | **34.92** | **34.97** | **35.02** | **35.05** | **35.07** | **35.09** | **35.11** | **35.12** | **35.13** | **35.14** | **35.15** |
| 2008 | 0.01 | 0.58 | 3.58 | **7.32** | **13.99** | **18.21** | **21.11** | **22.64** | **23.56** | **24.14** | **24.53** | **24.80** | **25.01** | **25.16** | **25.28** | **25.37** | **25.44** | **25.50** | **25.55** | **25.59** | **25.62** | **25.64** | **25.66** | **25.67** | **25.69** | **25.70** | **25.70** | **25.71** | **25.72** | **25.72** |
| 2009 | 0.09 | 0.91 | **2.65** | **6.83** | **9.77** | **11.90** | **13.10** | **13.85** | **14.33** | **14.66** | **14.89** | **15.06** | **15.19** | **15.29** | **15.37** | **15.43** | **15.48** | **15.52** | **15.55** | **15.58** | **15.60** | **15.61** | **15.63** | **15.64** | **15.65** | **15.65** | **15.66** | **15.66** | **15.67** | **15.67** |
| 2010 | 0.01 | **0.28** | **2.42** | **4.80** | **6.84** | **8.11** | **8.99** | **9.60** | **10.02** | **10.32** | **10.54** | **10.70** | **10.83** | **10.93** | **11.01** | **11.07** | **11.13** | **11.17** | **11.21** | **11.24** | **11.26** | **11.28** | **11.30** | **11.32** | **11.33** | **11.34** | **11.35** | **11.35** | **11.36** | **11.37** |
| 2011 | **0.08** | **0.90** | **2.50** | **4.22** | **5.38** | **6.22** | **6.82** | **7.25** | **7.55** | **7.76** | **7.92** | **8.04** | **8.14** | **8.21** | **8.27** | **8.32** | **8.36** | **8.39** | **8.42** | **8.44** | **8.46** | **8.47** | **8.48** | **8.50** | **8.50** | **8.51** | **8.52** | **8.52** | **8.53** | **8.53** |
| 2012 | **0.02** | **0.33** | **1.37** | **2.36** | **3.15** | **3.74** | **4.18** | **4.50** | **4.73** | **4.90** | **5.02** | **5.11** | **5.18** | **5.23** | **5.28** | **5.31** | **5.34** | **5.36** | **5.38** | **5.39** | **5.40** | **5.41** | **5.42** | **5.42** | **5.43** | **5.43** | **5.44** | **5.44** | **5.44** | **5.44** |
| 2013 | **0.01** | **0.34** | **1.18** | **2.11** | **2.88** | **3.47** | **3.91** | **4.23** | **4.46** | **4.63** | **4.75** | **4.84** | **4.91** | **4.97** | **5.01** | **5.05** | **5.08** | **5.10** | **5.12** | **5.13** | **5.14** | **5.15** | **5.16** | **5.17** | **5.17** | **5.17** | **5.18** | **5.18** | **5.18** | **5.18** |
| 2014 | **0.01** | **0.31** | **1.15** | **2.12** | **2.97** | **3.65** | **4.17** | **4.54** | **4.81** | **5.00** | **5.14** | **5.25** | **5.33** | **5.40** | **5.45** | **5.49** | **5.53** | **5.55** | **5.57** | **5.59** | **5.61** | **5.62** | **5.63** | **5.63** | **5.64** | **5.64** | **5.65** | **5.65** | **5.65** | **5.66** |
| 2015 | **0.01** | **0.34** | **1.29** | **2.40** | **3.37** | **4.17** | **4.78** | **5.22** | **5.53** | **5.75** | **5.91** | **6.04** | **6.13** | **6.21** | **6.28** | **6.33** | **6.37** | **6.40** | **6.43** | **6.45** | **6.47** | **6.48** | **6.49** | **6.50** | **6.51** | **6.51** | **6.52** | **6.52** | **6.53** | **6.53** |
| 2016 | **0.01** | **0.35** | **1.36** | **2.52** | **3.54** | **4.36** | **4.99** | **5.44** | **5.76** | **5.99** | **6.15** | **6.28** | **6.38** | **6.46** | **6.53** | **6.58** | **6.62** | **6.66** | **6.69** | **6.71** | **6.73** | **6.74** | **6.75** | **6.76** | **6.77** | **6.78** | **6.78** | **6.79** | **6.79** | **6.79** |
| 2017 | **0.01** | **0.38** | **1.46** | **2.72** | **3.82** | **4.69** | **5.36** | **5.84** | **6.18** | **6.41** | **6.58** | **6.72** | **6.83** | **6.92** | **6.99** | **7.04** | **7.09** | **7.12** | **7.15** | **7.18** | **7.20** | **7.21** | **7.23** | **7.24** | **7.25** | **7.25** | **7.26** | **7.26** | **7.27** | **7.27** |
| 2018 | **0.01** | **0.39** | **1.49** | **2.79** | **3.92** | **4.81** | **5.50** | **5.99** | **6.33** | **6.57** | **6.75** | **6.89** | **7.00** | **7.09** | **7.17** | **7.23** | **7.27** | **7.31** | **7.34** | **7.37** | **7.39** | **7.41** | **7.42** | **7.43** | **7.44** | **7.45** | **7.45** | **7.46** | **7.46** | **7.47** |

**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 | 73.85 | 78.44 | 81.22 | 82.88 | 84.67 | 85.58 | 86.06 | 86.44 | 86.62 | **86.75** | **87.07** | **87.32** | **87.52** | **87.76** | **87.97** | **88.16** | **88.32** | **88.47** | **88.60** |
| 1992 | 0.22 | 3.36 | 9.97 | 16.29 | 27.10 | 35.43 | 47.38 | 56.81 | 61.57 | 68.30 | 74.10 | 79.00 | 81.88 | 83.62 | 85.03 | 86.02 | 86.63 | 86.93 | 87.17 | **87.32** | **87.66** | **87.92** | **88.13** | **88.38** | **88.60** | **88.79** | **88.96** | **89.11** | **89.24** | **89.36** |
| 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 | 86.55 | 87.09 | 87.37 | 87.58 | **87.72** | **88.02** | **88.26** | **88.44** | **88.67** | **88.86** | **89.03** | **89.17** | **89.30** | **89.42** | **89.52** | **89.61** |
| 1994 | 0.30 | 2.78 | 12.42 | 22.30 | 38.37 | 50.01 | 55.69 | 65.17 | 72.53 | 78.64 | 82.18 | 84.28 | 85.74 | 86.73 | 87.29 | 87.51 | 87.69 | **87.81** | **88.13** | **88.37** | **88.56** | **88.80** | **88.99** | **89.16** | **89.31** | **89.45** | **89.56** | **89.67** | **89.76** | **89.84** |
| 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 | **88.34** | **88.56** | **88.73** | **88.86** | **89.02** | **89.16** | **89.28** | **89.38** | **89.47** | **89.55** | **89.62** | **89.69** | **89.74** | **89.79** |
| 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 | **89.50** | **89.75** | **89.93** | **90.07** | **90.23** | **90.37** | **90.48** | **90.58** | **90.67** | **90.74** | **90.81** | **90.86** | **90.91** | **90.95** | **90.99** |
| 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 | 90.01 | 90.13 | **90.22** | **90.51** | **90.72** | **90.88** | **91.07** | **91.23** | **91.36** | **91.47** | **91.57** | **91.65** | **91.72** | **91.78** | **91.84** | **91.88** | **91.93** | **91.96** |
| 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 | **89.32** | **89.70** | **89.98** | **90.20** | **90.45** | **90.65** | **90.82** | **90.97** | **91.09** | **91.20** | **91.29** | **91.37** | **91.44** | **91.50** | **91.55** | **91.60** | **91.64** |
| 1999 | 0.39 | 4.37 | 35.48 | 55.40 | 68.30 | 75.59 | 81.17 | 84.98 | 87.67 | 88.90 | 89.31 | 89.55 | **89.74** | **90.30** | **90.71** | **91.02** | **91.38** | **91.67** | **91.91** | **92.11** | **92.28** | **92.42** | **92.54** | **92.64** | **92.73** | **92.81** | **92.88** | **92.94** | **92.99** | **93.03** |
| 2000 | 1.07 | 33.92 | 54.34 | 67.29 | 74.66 | 80.44 | 84.41 | 87.28 | 88.59 | 89.00 | 89.25 | **89.42** | **90.01** | **90.46** | **90.80** | **91.18** | **91.49** | **91.75** | **91.96** | **92.13** | **92.28** | **92.41** | **92.52** | **92.61** | **92.69** | **92.76** | **92.82** | **92.87** | **92.91** | **92.94** |
| 2001 | 4.98 | 24.16 | 46.69 | 60.33 | 72.21 | 79.94 | 85.06 | 87.09 | 87.84 | 88.23 | **88.49** | **89.31** | **89.94** | **90.45** | **91.03** | **91.49** | **91.85** | **92.16** | **92.41** | **92.62** | **92.79** | **92.94** | **93.06** | **93.17** | **93.26** | **93.34** | **93.41** | **93.46** | **93.50** | **93.53** |
| 2002 | 2.35 | 29.42 | 46.37 | 62.76 | 73.96 | 81.62 | 84.55 | 85.35 | 85.81 | **86.08** | **87.00** | **87.71** | **88.31** | **89.03** | **89.60** | **90.06** | **90.44** | **90.75** | **91.00** | **91.21** | **91.39** | **91.54** | **91.67** | **91.78** | **91.87** | **91.95** | **92.01** | **92.05** | **92.09** | **92.12** |
| 2003 | 8.09 | 28.68 | 52.92 | 69.12 | 79.02 | 82.62 | 83.55 | 84.01 | **84.33** | **85.32** | **86.10** | **86.75** | **87.56** | **88.22** | **88.74** | **89.17** | **89.52** | **89.80** | **90.04** | **90.24** | **90.40** | **90.54** | **90.66** | **90.77** | **90.85** | **90.92** | **90.96** | **91.00** | **91.04** | **91.07** |
| 2004 | 6.65 | 34.65 | 57.06 | 71.25 | 76.30 | 77.71 | 78.40 | **78.83** | **80.16** | **81.20** | **82.11** | **83.23** | **84.19** | **84.96** | **85.59** | **86.11** | **86.53** | **86.87** | **87.16** | **87.40** | **87.61** | **87.78** | **87.93** | **88.05** | **88.14** | **88.21** | **88.26** | **88.32** | **88.36** | **88.40** |
| 2005 | 9.32 | 29.44 | 47.44 | 57.03 | 59.69 | 60.89 | **61.47** | **63.19** | **64.58** | **65.88** | **67.61** | **69.19** | **70.55** | **71.71** | **72.69** | **73.51** | **74.20** | **74.78** | **75.27** | **75.70** | **76.06** | **76.38** | **76.66** | **76.85** | **76.99** | **77.12** | **77.24** | **77.34** | **77.43** | **77.51** |
| 2006 | 2.41 | 14.92 | 29.96 | 39.63 | 42.50 | **43.53** | **45.65** | **47.32** | **48.92** | **51.11** | **53.14** | **54.97** | **56.56** | **57.94** | **59.11** | **60.09** | **60.93** | **61.64** | **62.25** | **62.77** | **63.23** | **63.62** | **63.91** | **64.10** | **64.28** | **64.45** | **64.59** | **64.73** | **64.85** | **64.96** |
| 2007 | 1.60 | 13.10 | 29.79 | 37.66 | **39.30** | **41.35** | **42.91** | **44.42** | **46.50** | **48.42** | **50.19** | **51.76** | **53.12** | **54.27** | **55.25** | **56.06** | **56.76** | **57.36** | **57.88** | **58.32** | **58.71** | **58.99** | **59.19** | **59.36** | **59.52** | **59.67** | **59.80** | **59.92** | **60.03** | **60.13** |
| 2008 | 0.57 | 25.76 | 40.39 | **45.71** | **48.51** | **50.54** | **52.48** | **55.13** | **57.54** | **59.72** | **61.62** | **63.23** | **64.59** | **65.71** | **66.65** | **67.42** | **68.07** | **68.61** | **69.07** | **69.46** | **69.73** | **69.92** | **70.09** | **70.24** | **70.37** | **70.50** | **70.61** | **70.71** | **70.80** | **70.88** |
| 2009 | 12.85 | 30.29 | **39.58** | **45.77** | **50.00** | **53.77** | **58.68** | **62.93** | **66.48** | **69.40** | **71.79** | **73.72** | **75.26** | **76.50** | **77.51** | **78.32** | **78.98** | **79.53** | **79.99** | **80.31** | **80.53** | **80.72** | **80.90** | **81.05** | **81.19** | **81.31** | **81.42** | **81.52** | **81.61** | **81.70** |
| 2010 | 2.31 | **9.22** | **21.93** | **31.36** | **38.91** | **48.20** | **55.95** | **62.18** | **67.17** | **71.11** | **74.27** | **76.72** | **78.65** | **80.18** | **81.39** | **82.38** | **83.18** | **83.84** | **84.30** | **84.61** | **84.88** | **85.12** | **85.34** | **85.53** | **85.70** | **85.85** | **85.99** | **86.11** | **86.22** | **86.32** |
| 2011 | **1.24** | **16.12** | **29.47** | **39.84** | **50.74** | **59.19** | **65.71** | **70.79** | **74.73** | **77.77** | **80.09** | **81.89** | **83.30** | **84.42** | **85.30** | **86.02** | **86.61** | **87.01** | **87.28** | **87.52** | **87.72** | **87.91** | **88.07** | **88.22** | **88.35** | **88.46** | **88.57** | **88.66** | **88.75** | **88.83** |
| 2012 | **5.12** | **20.57** | **36.03** | **51.75** | **61.93** | **69.22** | **74.68** | **78.75** | **81.80** | **84.08** | **85.84** | **87.20** | **88.25** | **89.09** | **89.75** | **90.29** | **90.65** | **90.90** | **91.11** | **91.30** | **91.46** | **91.61** | **91.74** | **91.85** | **91.95** | **92.05** | **92.13** | **92.20** | **92.27** | **92.33** |
| 2013 | **3.98** | **21.09** | **42.77** | **57.14** | **65.86** | **72.24** | **77.00** | **80.54** | **83.21** | **85.24** | **86.80** | **88.01** | **88.96** | **89.71** | **90.31** | **90.71** | **90.98** | **91.22** | **91.42** | **91.60** | **91.76** | **91.89** | **92.02** | **92.13** | **92.23** | **92.31** | **92.39** | **92.47** | **92.53** | **92.59** |
| 2014 | **4.38** | **25.59** | **44.62** | **57.49** | **65.58** | **71.52** | **76.06** | **79.50** | **82.14** | **84.19** | **85.79** | **87.03** | **88.01** | **88.79** | **89.31** | **89.65** | **89.95** | **90.21** | **90.43** | **90.63** | **90.80** | **90.95** | **91.09** | **91.21** | **91.32** | **91.42** | **91.51** | **91.59** | **91.66** | **91.73** |
| 2015 | **5.37** | **25.72** | **43.65** | **55.95** | **63.79** | **69.53** | **73.97** | **77.43** | **80.15** | **82.29** | **83.98** | **85.29** | **86.34** | **87.03** | **87.49** | **87.88** | **88.22** | **88.51** | **88.77** | **88.99** | **89.19** | **89.37** | **89.52** | **89.66** | **89.79** | **89.90** | **90.01** | **90.10** | **90.18** | **90.26** |
| 2016 | **5.59** | **25.53** | **43.01** | **55.09** | **62.87** | **68.64** | **73.13** | **76.65** | **79.47** | **81.69** | **83.44** | **84.80** | **85.70** | **86.28** | **86.78** | **87.21** | **87.58** | **87.89** | **88.17** | **88.41** | **88.63** | **88.82** | **88.99** | **89.14** | **89.28** | **89.40** | **89.51** | **89.61** | **89.69** | **89.78** |
| 2017 | **5.25** | **24.56** | **41.54** | **53.36** | **61.13** | **67.01** | **71.65** | **75.31** | **78.30** | **80.66** | **82.51** | **83.72** | **84.50** | **85.16** | **85.72** | **86.19** | **86.60** | **86.96** | **87.27** | **87.54** | **87.77** | **87.98** | **88.17** | **88.34** | **88.49** | **88.62** | **88.74** | **88.85** | **88.95** | **89.04** |
| 2018 | **5.27** | **24.34** | **40.97** | **52.54** | **60.25** | **66.20** | **70.92** | **74.69** | **77.78** | **80.21** | **81.80** | **82.82** | **83.68** | **84.40** | **85.01** | **85.53** | **85.97** | **86.36** | **86.69** | **86.98** | **87.24** | **87.47** | **87.67** | **87.85** | **88.01** | **88.15** | **88.28** | **88.40** | **88.51** | **88.60** |

**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 | 0.51 | 1.98 | 3.60 | 3.17 | 2.98 | 1.90 | 0.84 | 0.66 | 0.34 | 0.28 | 0.10 | 0.07 | 0.00 | 0.06 | 0.12 | 0.39 | **0.10** | **0.24** | **0.07** | **0.10** | **0.10** | **0.09** | **0.08** | **0.07** | **0.06** | **0.05** | **0.04** | **0.04** | **0.03** |
| 1995 | 0.00 | 0.63 | 2.23 | 2.46 | 3.82 | 4.00 | 1.21 | 1.01 | 1.85 | 0.47 | 0.33 | 1.57 | 0.80 | 0.54 | 0.69 | 0.49 | **0.74** | **0.16** | **0.11** | **0.15** | **0.14** | **0.13** | **0.11** | **0.10** | **0.09** | **0.08** | **0.07** | **0.05** | **0.04** | **0.03** |
| 1996 | 0.01 | 0.44 | 2.20 | 3.99 | 3.16 | 1.43 | 1.82 | 0.71 | 1.07 | 1.25 | 0.89 | 0.42 | 0.58 | 0.28 | 1.15 | **0.06** | **0.75** | **0.25** | **0.39** | **0.35** | **0.31** | **0.27** | **0.23** | **0.20** | **0.17** | **0.14** | **0.11** | **0.09** | **0.07** | **0.05** |
| 1997 | 0.01 | 0.39 | 2.08 | 3.73 | 2.83 | 2.55 | 2.16 | 1.15 | 0.82 | 0.39 | 0.83 | 1.22 | 1.05 | 0.97 | **0.32** | **0.54** | **0.32** | **0.51** | **0.47** | **0.42** | **0.36** | **0.31** | **0.27** | **0.23** | **0.19** | **0.16** | **0.13** | **0.10** | **0.08** | **0.06** |
| 1998 | 0.00 | 0.29 | 1.21 | 1.37 | 1.63 | 1.94 | 1.84 | 1.46 | 0.62 | 0.00 | 0.64 | 0.40 | 1.00 | **0.69** | **1.42** | **0.36** | **0.57** | **0.52** | **0.46** | **0.40** | **0.35** | **0.31** | **0.26** | **0.22** | **0.18** | **0.15** | **0.12** | **0.09** | **0.07** | **0.05** |
| 1999 | 0.00 | 0.15 | 0.51 | 1.03 | 2.48 | 1.84 | 1.35 | 0.61 | 0.93 | 0.62 | 1.23 | 0.79 | **1.44** | **1.46** | **0.52** | **0.75** | **0.67** | **0.60** | **0.52** | **0.46** | **0.40** | **0.34** | **0.29** | **0.24** | **0.20** | **0.16** | **0.13** | **0.11** | **0.08** | **0.06** |
| 2000 | 0.00 | 0.41 | 1.86 | 4.25 | 2.70 | 2.96 | 2.00 | 1.75 | 2.42 | 1.24 | 4.37 | **1.97** | **1.23** | **0.69** | **1.05** | **0.93** | **0.83** | **0.72** | **0.63** | **0.55** | **0.48** | **0.40** | **0.33** | **0.27** | **0.22** | **0.18** | **0.15** | **0.12** | **0.09** | **0.07** |
| 2001 | 0.03 | 0.21 | 1.99 | 3.01 | 2.15 | 1.89 | 1.77 | 2.97 | 6.11 | 4.44 | **2.41** | **2.69** | **1.14** | **1.43** | **1.07** | **0.87** | **0.74** | **0.65** | **0.57** | **0.49** | **0.42** | **0.35** | **0.29** | **0.24** | **0.19** | **0.16** | **0.13** | **0.10** | **0.08** | **0.06** |
| 2002 | 0.01 | 0.41 | 1.80 | 2.08 | 2.60 | 3.17 | 5.06 | 4.97 | 5.10 | **2.29** | **3.33** | **1.73** | **2.07** | **1.48** | **1.17** | **0.96** | **0.84** | **0.74** | **0.65** | **0.56** | **0.47** | **0.40** | **0.33** | **0.27** | **0.23** | **0.18** | **0.15** | **0.12** | **0.09** | **0.07** |
| 2003 | 0.02 | 0.74 | 2.18 | 2.87 | 3.41 | 5.98 | 5.58 | 5.58 | **2.99** | **4.45** | **2.39** | **2.80** | **1.89** | **1.47** | **1.18** | **1.02** | **0.90** | **0.79** | **0.69** | **0.59** | **0.49** | **0.41** | **0.34** | **0.28** | **0.23** | **0.19** | **0.16** | **0.12** | **0.09** | **0.07** |
| 2004 | 0.13 | 1.26 | 2.77 | 3.90 | 6.27 | 6.91 | 6.06 | **3.59** | **5.80** | **3.41** | **3.92** | **2.59** | **1.89** | **1.53** | **1.32** | **1.16** | **1.02** | **0.90** | **0.77** | **0.65** | **0.55** | **0.46** | **0.38** | **0.32** | **0.27** | **0.22** | **0.17** | **0.14** | **0.11** | **0.08** |
| 2005 | 0.23 | 2.04 | 4.08 | 5.55 | 7.08 | 5.63 | **4.04** | **7.10** | **4.53** | **5.19** | **3.24** | **2.11** | **1.55** | **1.27** | **1.07** | **0.92** | **0.80** | **0.68** | **0.57** | **0.48** | **0.40** | **0.33** | **0.27** | **0.23** | **0.19** | **0.15** | **0.12** | **0.10** | **0.07** | **0.05** |
| 2006 | 0.00 | 1.82 | 6.17 | 7.01 | 12.21 | **5.30** | **7.84** | **5.78** | **7.00** | **4.41** | **2.90** | **2.02** | **1.60** | **1.30** | **1.06** | **0.91** | **0.76** | **0.63** | **0.52** | **0.43** | **0.35** | **0.29** | **0.25** | **0.21** | **0.17** | **0.14** | **0.11** | **0.09** | **0.07** | **0.05** |
| 2007 | 0.00 | 2.56 | 4.39 | 11.90 | **4.81** | **13.12** | **10.66** | **12.80** | **8.10** | **5.05** | **3.19** | **2.24** | **1.69** | **1.38** | **1.10** | **0.90** | **0.73** | **0.60** | **0.50** | **0.41** | **0.34** | **0.29** | **0.25** | **0.20** | **0.16** | **0.13** | **0.11** | **0.08** | **0.07** | **0.05** |
| 2008 | 0.00 | 1.08 | 6.11 | **8.22** | **17.97** | **14.89** | **19.42** | **13.13** | **8.38** | **5.10** | **3.38** | **2.40** | **1.77** | **1.38** | **1.09** | **0.87** | **0.71** | **0.57** | **0.47** | **0.38** | **0.32** | **0.28** | **0.22** | **0.18** | **0.14** | **0.11** | **0.09** | **0.07** | **0.05** | **0.04** |
| 2009 | 0.05 | 0.75 | **3.40** | **10.39** | **10.00** | **14.58** | **11.10** | **7.96** | **5.52** | **3.94** | **2.89** | **2.20** | **1.72** | **1.34** | **1.06** | **0.84** | **0.69** | **0.56** | **0.46** | **0.40** | **0.34** | **0.28** | **0.22** | **0.18** | **0.14** | **0.11** | **0.09** | **0.07** | **0.06** | **0.04** |
| 2010 | 0.08 | **1.05** | **6.11** | **7.48** | **11.45** | **9.10** | **7.08** | **5.17** | **3.89** | **2.95** | **2.29** | **1.81** | **1.43** | **1.12** | **0.89** | **0.73** | **0.59** | **0.49** | **0.42** | **0.36** | **0.30** | **0.24** | **0.19** | **0.16** | **0.12** | **0.10** | **0.08** | **0.06** | **0.05** | **0.03** |
| 2011 | **0.03** | **1.32** | **4.05** | **7.20** | **6.09** | **5.22** | **4.23** | **3.32** | **2.63** | **2.12** | **1.70** | **1.38** | **1.13** | **0.94** | **0.79** | **0.67** | **0.57** | **0.50** | **0.43** | **0.36** | **0.29** | **0.24** | **0.19** | **0.15** | **0.12** | **0.10** | **0.08** | **0.06** | **0.05** | **0.03** |
| 2012 | **0.07** | **0.97** | **4.33** | **4.58** | **4.42** | **3.99** | **3.51** | **2.88** | **2.37** | **1.94** | **1.57** | **1.29** | **1.09** | **0.93** | **0.80** | **0.68** | **0.60** | **0.53** | **0.44** | **0.36** | **0.30** | **0.24** | **0.19** | **0.15** | **0.12** | **0.10** | **0.08** | **0.06** | **0.05** | **0.03** |
| 2013 | **0.03** | **0.73** | **2.42** | **3.21** | **3.42** | **3.41** | **3.18** | **2.71** | **2.30** | **1.89** | **1.55** | **1.32** | **1.13** | **0.97** | **0.83** | **0.74** | **0.65** | **0.54** | **0.45** | **0.37** | **0.30** | **0.24** | **0.20** | **0.16** | **0.12** | **0.10** | **0.08** | **0.06** | **0.05** | **0.03** |
| 2014 | **0.01** | **0.35** | **1.68** | **2.72** | **3.22** | **3.34** | **3.23** | **2.80** | **2.33** | **1.91** | **1.59** | **1.35** | **1.15** | **0.99** | **0.89** | **0.79** | **0.67** | **0.56** | **0.46** | **0.38** | **0.31** | **0.25** | **0.20** | **0.16** | **0.13** | **0.10** | **0.08** | **0.07** | **0.05** | **0.04** |
| 2015 | **0.02** | **0.37** | **1.69** | **2.74** | **3.23** | **3.37** | **3.21** | **2.73** | **2.26** | **1.84** | **1.54** | **1.30** | **1.12** | **1.01** | **0.91** | **0.77** | **0.65** | **0.54** | **0.45** | **0.37** | **0.30** | **0.25** | **0.20** | **0.16** | **0.13** | **0.10** | **0.08** | **0.06** | **0.05** | **0.04** |
| 2016 | **0.02** | **0.41** | **1.89** | **2.96** | **3.46** | **3.53** | **3.25** | **2.71** | **2.21** | **1.80** | **1.50** | **1.28** | **1.15** | **1.04** | **0.89** | **0.75** | **0.64** | **0.53** | **0.44** | **0.36** | **0.30** | **0.24** | **0.20** | **0.15** | **0.12** | **0.10** | **0.08** | **0.06** | **0.05** | **0.04** |
| 2017 | **0.02** | **0.46** | **2.09** | **3.23** | **3.69** | **3.65** | **3.31** | **2.73** | **2.20** | **1.78** | **1.48** | **1.32** | **1.18** | **1.01** | **0.87** | **0.74** | **0.62** | **0.52** | **0.44** | **0.36** | **0.29** | **0.24** | **0.19** | **0.15** | **0.12** | **0.10** | **0.08** | **0.06** | **0.05** | **0.03** |
| 2018 | **0.02** | **0.50** | **2.26** | **3.43** | **3.78** | **3.69** | **3.33** | **2.70** | **2.17** | **1.75** | **1.52** | **1.34** | **1.14** | **0.98** | **0.84** | **0.71** | **0.61** | **0.51** | **0.43** | **0.35** | **0.29** | **0.24** | **0.19** | **0.15** | **0.12** | **0.10** | **0.08** | **0.06** | **0.05** | **0.03** |

**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 | 2.54 | 6.18 | 10.61 | 9.65 | 15.27 | 15.85 | 12.11 | 20.13 | 22.56 | 28.17 | 23.37 | 19.12 | 17.75 | 15.87 | 10.47 | 8.97 | 4.74 | **2.90** | **7.44** | **6.87** | **6.36** | **7.51** | **6.79** | **6.11** | **5.52** | **4.94** | **4.37** | **3.79** | **3.22** | **2.50** |
| 1995 | 2.24 | 18.74 | 20.75 | 27.25 | 17.98 | 13.59 | 23.49 | 26.93 | 24.09 | 24.25 | 20.00 | 15.37 | 14.08 | 9.68 | 3.92 | 5.01 | **2.16** | **8.17** | **7.55** | **6.97** | **8.21** | **7.42** | **6.68** | **6.04** | **5.43** | **4.83** | **4.23** | **3.70** | **3.19** | **2.52** |
| 1996 | 3.01 | 22.34 | 42.07 | 33.91 | 15.28 | 29.68 | 28.40 | 30.22 | 26.63 | 25.46 | 21.79 | 15.56 | 15.14 | 6.96 | 4.62 | **4.69** | **13.07** | **12.25** | **11.24** | **13.02** | **11.74** | **10.57** | **9.53** | **8.55** | **7.59** | **6.66** | **5.88** | **5.19** | **4.48** | **3.59** |
| 1997 | 4.48 | 38.56 | 42.46 | 19.75 | 34.56 | 28.81 | 34.06 | 30.41 | 28.49 | 25.97 | 22.68 | 11.50 | 6.13 | 3.52 | **4.98** | **13.37** | **12.55** | **11.53** | **13.30** | **12.00** | **10.81** | **9.75** | **8.74** | **7.78** | **6.84** | **6.07** | **5.41** | **4.77** | **4.12** | **3.28** |
| 1998 | 10.12 | 40.34 | 22.64 | 40.75 | 34.95 | 37.16 | 30.30 | 30.14 | 25.83 | 24.98 | 16.30 | 7.66 | 4.36 | **3.60** | **14.81** | **13.99** | **12.83** | **14.76** | **13.30** | **11.96** | **10.79** | **9.68** | **8.62** | **7.59** | **6.75** | **6.05** | **5.39** | **4.75** | **4.09** | **3.20** |
| 1999 | 2.66 | 9.34 | 30.61 | 30.40 | 31.89 | 27.61 | 28.80 | 29.50 | 25.56 | 16.29 | 9.08 | 7.18 | **3.65** | **15.93** | **15.04** | **13.87** | **15.92** | **14.35** | **12.92** | **11.67** | **10.49** | **9.36** | **8.27** | **7.38** | **6.64** | **5.96** | **5.33** | **4.73** | **4.11** | **2.95** |
| 2000 | 2.39 | 21.70 | 21.50 | 19.51 | 23.26 | 24.71 | 27.54 | 27.50 | 13.85 | 3.22 | 3.69 | **3.62** | **15.00** | **14.25** | **13.09** | **15.06** | **13.62** | **12.30** | **11.12** | **10.02** | **8.95** | **7.92** | **7.09** | **6.40** | **5.77** | **5.19** | **4.65** | **4.11** | **3.08** | **1.96** |
| 2001 | 3.34 | 31.69 | 30.15 | 27.16 | 33.16 | 31.95 | 29.63 | 15.76 | 5.62 | 3.09 | **3.25** | **16.24** | **15.89** | **15.06** | **17.67** | **16.16** | **14.58** | **13.16** | **11.84** | **10.58** | **9.37** | **8.39** | **7.59** | **6.86** | **6.19** | **5.58** | **5.00** | **3.83** | **2.74** | **2.22** |
| 2002 | 5.30 | 33.01 | 27.06 | 30.85 | 31.68 | 31.04 | 18.78 | 7.10 | 3.54 | **3.69** | **17.01** | **16.88** | **16.53** | **19.56** | **18.02** | **16.39** | **14.82** | **13.33** | **11.93** | **10.58** | **9.47** | **8.56** | **7.74** | **7.00** | **6.32** | **5.69** | **4.38** | **3.21** | **2.78** | **2.23** |
| 2003 | 13.49 | 28.11 | 33.59 | 33.92 | 33.45 | 21.71 | 7.80 | 4.86 | **3.74** | **16.50** | **16.58** | **16.65** | **20.58** | **18.93** | **17.32** | **15.72** | **14.14** | **12.65** | **11.22** | **10.06** | **9.11** | **8.25** | **7.47** | **6.76** | **6.10** | **4.72** | **3.50** | **3.09** | **2.66** | **2.08** |
| 2004 | 10.89 | 30.48 | 30.77 | 29.60 | 18.72 | 6.25 | 3.69 | **2.95** | **15.43** | **16.41** | **16.82** | **21.11** | **19.96** | **18.17** | **16.54** | **14.90** | **13.32** | **11.82** | **10.59** | **9.60** | **8.69** | **7.88** | **7.13** | **6.46** | **5.01** | **3.74** | **3.34** | **2.94** | **2.51** | **1.87** |
| 2005 | 14.34 | 24.62 | 22.82 | 17.82 | 5.27 | 2.72 | **2.05** | **10.17** | **11.32** | **12.75** | **16.54** | **16.28** | **14.99** | **13.62** | **12.34** | **11.02** | **9.75** | **8.73** | **7.89** | **7.14** | **6.46** | **5.85** | **5.29** | **4.10** | **3.07** | **2.75** | **2.46** | **2.16** | **1.85** | **1.40** |
| 2006 | 7.03 | 16.25 | 17.43 | 11.71 | 3.99 | **1.55** | **8.40** | **9.50** | **11.59** | **16.98** | **17.25** | **16.42** | **15.10** | **13.72** | **12.39** | **10.96** | **9.84** | **8.92** | **8.07** | **7.31** | **6.62** | **6.01** | **4.66** | **3.50** | **3.16** | **2.84** | **2.53** | **2.23** | **1.91** | **1.46** |
| 2007 | 6.42 | 18.87 | 21.48 | 8.44 | **2.04** | **6.17** | **7.20** | **9.21** | **14.57** | **17.16** | **17.80** | **16.79** | **15.45** | **13.81** | **12.48** | **11.26** | **10.28** | **9.34** | **8.46** | **7.69** | **6.98** | **5.44** | **4.12** | **3.73** | **3.37** | **3.03** | **2.71** | **2.40** | **2.08** | **1.67** |
| 2008 | 3.45 | 29.11 | 9.35 | **3.65** | **4.31** | **4.69** | **6.55** | **11.10** | **13.60** | **16.81** | **17.43** | **16.58** | **15.39** | **13.95** | **12.74** | **11.62** | **10.61** | **9.69** | **8.86** | **8.09** | **6.34** | **4.84** | **4.40** | **4.00** | **3.62** | **3.29** | **2.95** | **2.62** | **2.28** | **1.87** |
| 2009 | 2.48 | 10.40 | **7.53** | **8.48** | **7.70** | **9.32** | **15.06** | **17.83** | **20.34** | **22.52** | **22.15** | **20.53** | **18.69** | **17.09** | **15.66** | **14.23** | **12.86** | **11.64** | **10.54** | **8.16** | **6.20** | **5.62** | **5.10** | **4.61** | **4.18** | **3.79** | **3.40** | **3.02** | **2.63** | **2.18** |
| 2010 | 3.63 | **8.60** | **11.97** | **10.29** | **11.26** | **17.25** | **19.83** | **22.13** | **24.15** | **24.88** | **23.33** | **21.27** | **19.37** | **17.72** | **16.09** | **14.51** | **13.08** | **11.78** | **9.09** | **6.88** | **6.23** | **5.63** | **5.09** | **4.60** | **4.18** | **3.76** | **3.36** | **2.96** | **2.54** | **1.97** |
| 2011 | **1.04** | **16.93** | **15.92** | **16.05** | **21.14** | **23.42** | **25.65** | **27.68** | **29.02** | **29.09** | **27.03** | **24.61** | **22.30** | **20.11** | **17.99** | **16.12** | **14.46** | **11.13** | **8.42** | **7.60** | **6.87** | **6.22** | **5.62** | **5.09** | **4.63** | **4.16** | **3.71** | **3.27** | **2.81** | **2.18** |
| 2012 | **6.16** | **20.92** | **21.53** | **25.37** | **24.52** | **26.09** | **27.69** | **28.95** | **29.57** | **29.25** | **26.97** | **24.35** | **21.75** | **19.42** | **17.35** | **15.53** | **11.95** | **9.05** | **8.17** | **7.39** | **6.69** | **6.06** | **5.48** | **4.98** | **4.53** | **4.06** | **3.63** | **3.20** | **2.74** | **2.12** |
| 2013 | **6.85** | **29.13** | **34.43** | **30.18** | **27.33** | **27.98** | **28.79** | **29.27** | **29.21** | **28.60** | **26.06** | **23.20** | **20.69** | **18.45** | **16.49** | **12.69** | **9.62** | **8.69** | **7.85** | **7.11** | **6.45** | **5.84** | **5.29** | **4.83** | **4.37** | **3.93** | **3.50** | **3.09** | **2.66** | **2.08** |
| 2014 | **6.69** | **37.25** | **38.57** | **32.33** | **28.04** | **27.77** | **28.08** | **28.24** | **28.35** | **28.12** | **25.68** | **22.85** | **20.31** | **18.10** | **13.92** | **10.55** | **9.51** | **8.58** | **7.76** | **7.03** | **6.37** | **5.77** | **5.24** | **4.78** | **4.33** | **3.89** | **3.48** | **3.07** | **2.66** | **2.14** |
| 2015 | **10.26** | **39.46** | **37.87** | **31.81** | **27.78** | **27.55** | **27.88** | **28.34** | **28.76** | **28.54** | **25.97** | **23.11** | **20.54** | **15.78** | **11.94** | **10.74** | **9.67** | **8.73** | **7.88** | **7.14** | **6.47** | **5.85** | **5.32** | **4.85** | **4.40** | **3.95** | **3.53** | **3.11** | **2.68** | **2.13** |
| 2016 | **11.02** | **39.30** | **36.60** | **30.66** | **26.71** | **26.63** | **27.48** | **28.49** | **29.18** | **29.01** | **26.39** | **23.46** | **18.03** | **13.62** | **12.23** | **10.99** | **9.89** | **8.91** | **8.05** | **7.29** | **6.59** | **5.96** | **5.42** | **4.96** | **4.48** | **4.02** | **3.58** | **3.16** | **2.71** | **2.14** |
| 2017 | **10.42** | **38.01** | **35.45** | **29.42** | **25.59** | **25.95** | **27.18** | **28.50** | **29.45** | **29.35** | **26.75** | **20.62** | **15.61** | **13.97** | **12.52** | **11.24** | **10.11** | **9.10** | **8.22** | **7.43** | **6.72** | **6.07** | **5.52** | **5.05** | **4.55** | **4.07** | **3.63** | **3.20** | **2.75** | **2.18** |
| 2018 | **9.83** | **36.58** | **34.06** | **28.20** | **24.98** | **25.68** | **27.09** | **28.80** | **29.80** | **29.69** | **23.57** | **17.94** | **16.05** | **14.34** | **12.85** | **11.52** | **10.35** | **9.31** | **8.41** | **7.59** | **6.86** | **6.19** | **5.64** | **5.13** | **4.61** | **4.13** | **3.68** | **3.25** | **2.79** | **2.21** |

**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 | 0.51 | 2.32 | 5.18 | 7.37 | 9.04 | 9.91 | 10.24 | 10.44 | 10.52 | 10.57 | 10.58 | 10.59 | 10.59 | 10.59 | 10.60 | 10.62 | **10.63** | **10.64** | **10.65** | **10.65** | **10.66** | **10.66** | **10.66** | **10.67** | **10.67** | **10.67** | **10.67** | **10.67** | **10.67** |
| 1995 | 0.00 | 0.62 | 2.38 | 3.88 | 5.51 | 6.84 | 7.17 | 7.38 | 7.65 | 7.71 | 7.73 | 7.84 | 7.88 | 7.90 | 7.93 | 7.95 | **7.98** | **7.98** | **7.99** | **7.99** | **8.00** | **8.00** | **8.00** | **8.00** | **8.01** | **8.01** | **8.01** | **8.01** | **8.01** | **8.01** |
| 1996 | 0.01 | 0.44 | 2.09 | 3.76 | 4.57 | 4.87 | 5.14 | 5.21 | 5.28 | 5.35 | 5.38 | 5.39 | 5.40 | 5.41 | 5.43 | **5.43** | **5.44** | **5.45** | **5.45** | **5.46** | **5.46** | **5.46** | **5.46** | **5.47** | **5.47** | **5.47** | **5.47** | **5.47** | **5.47** | **5.47** |
| 1997 | 0.01 | 0.39 | 1.60 | 2.81 | 3.51 | 3.90 | 4.13 | 4.20 | 4.24 | 4.25 | 4.27 | 4.30 | 4.31 | 4.33 | **4.34** | **4.34** | **4.35** | **4.35** | **4.36** | **4.36** | **4.36** | **4.36** | **4.36** | **4.37** | **4.37** | **4.37** | **4.37** | **4.37** | **4.37** | **4.37** |
| 1998 | 0.00 | 0.26 | 0.91 | 1.46 | 1.85 | 2.13 | 2.30 | 2.39 | 2.41 | 2.41 | 2.43 | 2.43 | 2.45 | **2.46** | **2.49** | **2.49** | **2.50** | **2.50** | **2.51** | **2.51** | **2.51** | **2.51** | **2.51** | **2.52** | **2.52** | **2.52** | **2.52** | **2.52** | **2.52** | **2.52** |
| 1999 | 0.00 | 0.15 | 0.60 | 1.23 | 2.26 | 2.76 | 3.02 | 3.10 | 3.19 | 3.23 | 3.30 | 3.34 | **3.41** | **3.47** | **3.49** | **3.52** | **3.54** | **3.55** | **3.56** | **3.57** | **3.57** | **3.58** | **3.58** | **3.58** | **3.58** | **3.58** | **3.59** | **3.59** | **3.59** | **3.59** |
| 2000 | 0.00 | 0.40 | 1.81 | 4.30 | 5.50 | 6.48 | 6.95 | 7.24 | 7.52 | 7.65 | 8.06 | **8.23** | **8.33** | **8.38** | **8.44** | **8.49** | **8.52** | **8.55** | **8.57** | **8.58** | **8.59** | **8.60** | **8.61** | **8.61** | **8.62** | **8.62** | **8.62** | **8.63** | **8.63** | **8.63** |
| 2001 | 0.03 | 0.23 | 1.55 | 2.90 | 3.57 | 3.95 | 4.18 | 4.45 | 4.90 | 5.19 | **5.33** | **5.49** | **5.54** | **5.59** | **5.63** | **5.65** | **5.67** | **5.68** | **5.69** | **5.69** | **5.70** | **5.70** | **5.71** | **5.71** | **5.71** | **5.71** | **5.71** | **5.71** | **5.71** | **5.71** |
| 2002 | 0.01 | 0.41 | 1.54 | 2.48 | 3.26 | 3.88 | 4.53 | 5.02 | 5.46 | **5.64** | **5.89** | **5.99** | **6.09** | **6.15** | **6.18** | **6.21** | **6.22** | **6.24** | **6.25** | **6.25** | **6.26** | **6.26** | **6.27** | **6.27** | **6.27** | **6.27** | **6.27** | **6.27** | **6.27** | **6.27** |
| 2003 | 0.02 | 0.67 | 2.01 | 3.14 | 3.99 | 4.92 | 5.55 | 6.10 | **6.36** | **6.73** | **6.88** | **7.03** | **7.11** | **7.16** | **7.19** | **7.21** | **7.23** | **7.24** | **7.25** | **7.25** | **7.26** | **7.26** | **7.26** | **7.27** | **7.27** | **7.27** | **7.27** | **7.27** | **7.27** | **7.27** |
| 2004 | 0.13 | 1.26 | 2.94 | 4.51 | 6.19 | 7.57 | 8.62 | **9.19** | **10.05** | **10.44** | **10.81** | **11.00** | **11.10** | **11.17** | **11.21** | **11.25** | **11.27** | **11.29** | **11.30** | **11.31** | **11.32** | **11.33** | **11.33** | **11.33** | **11.34** | **11.34** | **11.34** | **11.34** | **11.34** | **11.34** |
| 2005 | 0.23 | 1.98 | 4.55 | 7.09 | 9.57 | 11.30 | **12.44** | **14.35** | **15.36** | **16.33** | **16.82** | **17.08** | **17.23** | **17.34** | **17.41** | **17.47** | **17.51** | **17.54** | **17.57** | **17.59** | **17.60** | **17.61** | **17.62** | **17.63** | **17.64** | **17.64** | **17.64** | **17.65** | **17.65** | **17.65** |
| 2006 | 0.00 | 1.70 | 6.41 | 10.51 | 16.30 | **18.41** | **21.38** | **23.21** | **25.07** | **26.03** | **26.52** | **26.80** | **26.97** | **27.09** | **27.17** | **27.24** | **27.28** | **27.31** | **27.34** | **27.36** | **27.37** | **27.38** | **27.39** | **27.40** | **27.40** | **27.41** | **27.41** | **27.42** | **27.42** | **27.42** |
| 2007 | 0.00 | 2.41 | 5.67 | 12.18 | **14.28** | **19.69** | **23.22** | **26.69** | **28.40** | **29.22** | **29.62** | **29.85** | **29.98** | **30.07** | **30.14** | **30.18** | **30.21** | **30.23** | **30.25** | **30.26** | **30.27** | **30.28** | **30.29** | **30.29** | **30.30** | **30.30** | **30.30** | **30.30** | **30.30** | **30.31** |
| 2008 | 0.00 | 1.05 | 5.20 | **9.91** | **19.02** | **24.87** | **30.98** | **34.03** | **35.50** | **36.19** | **36.55** | **36.76** | **36.88** | **36.95** | **37.01** | **37.04** | **37.07** | **37.09** | **37.10** | **37.11** | **37.12** | **37.12** | **37.13** | **37.13** | **37.13** | **37.13** | **37.14** | **37.14** | **37.14** | **37.14** |
| 2009 | 0.05 | 0.79 | **3.76** | **11.94** | **18.30** | **25.91** | **30.30** | **32.62** | **33.81** | **34.44** | **34.78** | **34.97** | **35.09** | **35.16** | **35.20** | **35.23** | **35.26** | **35.27** | **35.28** | **35.29** | **35.30** | **35.30** | **35.30** | **35.31** | **35.31** | **35.31** | **35.31** | **35.31** | **35.31** | **35.32** |
| 2010 | 0.09 | **1.11** | **6.57** | **12.03** | **18.87** | **23.06** | **25.45** | **26.72** | **27.42** | **27.80** | **28.01** | **28.13** | **28.21** | **28.25** | **28.28** | **28.30** | **28.32** | **28.33** | **28.34** | **28.34** | **28.35** | **28.35** | **28.35** | **28.35** | **28.36** | **28.36** | **28.36** | **28.36** | **28.36** | **28.36** |
| 2011 | **0.03** | **1.35** | **4.67** | **9.37** | **12.41** | **14.30** | **15.39** | **15.98** | **16.31** | **16.49** | **16.59** | **16.64** | **16.68** | **16.70** | **16.71** | **16.72** | **16.73** | **16.74** | **16.74** | **16.74** | **16.75** | **16.75** | **16.75** | **16.75** | **16.75** | **16.75** | **16.75** | **16.75** | **16.75** | **16.75** |
| 2012 | **0.07** | **0.99** | **4.18** | **6.67** | **8.35** | **9.42** | **10.08** | **10.45** | **10.66** | **10.78** | **10.84** | **10.88** | **10.90** | **10.92** | **10.93** | **10.94** | **10.94** | **10.95** | **10.95** | **10.95** | **10.95** | **10.95** | **10.95** | **10.96** | **10.96** | **10.96** | **10.96** | **10.96** | **10.96** | **10.96** |
| 2013 | **0.03** | **0.72** | **2.30** | **3.63** | **4.56** | **5.21** | **5.62** | **5.86** | **5.99** | **6.07** | **6.11** | **6.14** | **6.16** | **6.17** | **6.18** | **6.18** | **6.19** | **6.19** | **6.19** | **6.20** | **6.20** | **6.20** | **6.20** | **6.20** | **6.20** | **6.20** | **6.20** | **6.20** | **6.20** | **6.20** |
| 2014 | **0.01** | **0.34** | **1.32** | **2.26** | **2.99** | **3.50** | **3.85** | **4.05** | **4.17** | **4.23** | **4.27** | **4.29** | **4.31** | **4.32** | **4.33** | **4.33** | **4.34** | **4.34** | **4.34** | **4.34** | **4.34** | **4.35** | **4.35** | **4.35** | **4.35** | **4.35** | **4.35** | **4.35** | **4.35** | **4.35** |
| 2015 | **0.02** | **0.35** | **1.27** | **2.16** | **2.85** | **3.34** | **3.66** | **3.85** | **3.96** | **4.02** | **4.06** | **4.08** | **4.09** | **4.10** | **4.11** | **4.11** | **4.12** | **4.12** | **4.12** | **4.12** | **4.13** | **4.13** | **4.13** | **4.13** | **4.13** | **4.13** | **4.13** | **4.13** | **4.13** | **4.13** |
| 2016 | **0.02** | **0.39** | **1.41** | **2.38** | **3.14** | **3.68** | **4.02** | **4.22** | **4.33** | **4.39** | **4.43** | **4.45** | **4.46** | **4.47** | **4.48** | **4.49** | **4.49** | **4.49** | **4.50** | **4.50** | **4.50** | **4.50** | **4.50** | **4.50** | **4.50** | **4.50** | **4.50** | **4.50** | **4.50** | **4.50** |
| 2017 | **0.02** | **0.44** | **1.59** | **2.70** | **3.55** | **4.15** | **4.53** | **4.74** | **4.86** | **4.93** | **4.96** | **4.99** | **5.01** | **5.02** | **5.03** | **5.03** | **5.04** | **5.04** | **5.04** | **5.05** | **5.05** | **5.05** | **5.05** | **5.05** | **5.05** | **5.05** | **5.05** | **5.05** | **5.05** | **5.05** |
| 2018 | **0.02** | **0.48** | **1.76** | **3.00** | **3.93** | **4.58** | **4.99** | **5.22** | **5.34** | **5.41** | **5.45** | **5.48** | **5.50** | **5.51** | **5.52** | **5.53** | **5.53** | **5.54** | **5.54** | **5.54** | **5.55** | **5.55** | **5.55** | **5.55** | **5.55** | **5.55** | **5.55** | **5.55** | **5.55** | **5.55** |

**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 | 2.56 | 8.62 | 18.30 | 25.99 | 36.56 | 45.50 | 51.04 | 58.95 | 65.96 | 72.67 | 76.63 | 79.12 | 80.97 | 82.33 | 83.12 | 83.72 | 83.99 | **84.15** | **84.56** | **84.91** | **85.21** | **85.55** | **85.82** | **86.06** | **86.26** | **86.43** | **86.57** | **86.69** | **86.80** | **86.89** |
| 1995 | 2.24 | 20.63 | 37.01 | 53.56 | 61.24 | 65.78 | 72.24 | 77.82 | 81.41 | 84.10 | 85.76 | 86.76 | 87.53 | 87.99 | 88.15 | 88.37 | **88.45** | **88.76** | **89.02** | **89.24** | **89.49** | **89.69** | **89.85** | **89.99** | **90.11** | **90.21** | **90.30** | **90.37** | **90.43** | **90.49** |
| 1996 | 3.02 | 24.78 | 56.35 | 70.50 | 74.45 | 80.71 | 84.83 | 87.88 | 89.74 | 91.02 | 91.82 | 92.26 | 92.62 | 92.76 | 92.85 | **92.93** | **93.16** | **93.34** | **93.48** | **93.63** | **93.74** | **93.83** | **93.91** | **93.97** | **94.01** | **94.05** | **94.09** | **94.11** | **94.14** | **94.16** |
| 1997 | 4.50 | 41.50 | 66.23 | 72.61 | 81.14 | 85.58 | 89.19 | 91.24 | 92.55 | 93.39 | 93.92 | 94.14 | 94.23 | 94.29 | **94.35** | **94.54** | **94.68** | **94.80** | **94.92** | **95.01** | **95.09** | **95.14** | **95.19** | **95.23** | **95.26** | **95.29** | **95.31** | **95.33** | **95.34** | **95.36** |
| 1998 | 10.18 | 46.56 | 58.65 | 75.21 | 83.39 | 88.92 | 91.65 | 93.49 | 94.56 | 95.33 | 95.70 | 95.84 | 95.92 | **95.98** | **96.22** | **96.41** | **96.55** | **96.70** | **96.81** | **96.90** | **96.97** | **97.02** | **97.06** | **97.10** | **97.13** | **97.15** | **97.17** | **97.19** | **97.20** | **97.22** |
| 1999 | 2.67 | 11.81 | 38.89 | 57.37 | 70.67 | 78.20 | 83.73 | 87.66 | 90.04 | 91.15 | 91.67 | 92.03 | **92.20** | **92.93** | **93.49** | **93.92** | **94.35** | **94.66** | **94.91** | **95.10** | **95.25** | **95.37** | **95.46** | **95.54** | **95.60** | **95.66** | **95.70** | **95.74** | **95.78** | **95.80** |
| 2000 | 2.40 | 23.67 | 40.06 | 51.47 | 61.84 | 69.97 | 76.51 | 81.09 | 82.71 | 83.03 | 83.38 | **83.69** | **84.95** | **85.94** | **86.72** | **87.48** | **88.06** | **88.50** | **88.85** | **89.13** | **89.35** | **89.53** | **89.68** | **89.80** | **89.90** | **89.99** | **90.07** | **90.13** | **90.18** | **90.22** |
| 2001 | 3.35 | 34.11 | 54.01 | 66.17 | 76.51 | 82.91 | 86.82 | 88.25 | 88.66 | 88.86 | **89.06** | **90.00** | **90.74** | **91.32** | **91.88** | **92.30** | **92.62** | **92.85** | **93.04** | **93.18** | **93.30** | **93.39** | **93.46** | **93.53** | **93.58** | **93.63** | **93.67** | **93.69** | **93.71** | **93.73** |
| 2002 | 5.34 | 36.77 | 53.89 | 67.74 | 77.24 | 83.33 | 85.74 | 86.44 | 86.75 | **87.04** | **88.32** | **89.32** | **90.12** | **90.89** | **91.44** | **91.85** | **92.15** | **92.38** | **92.56** | **92.70** | **92.81** | **92.90** | **92.97** | **93.03** | **93.08** | **93.12** | **93.16** | **93.18** | **93.20** | **93.22** |
| 2003 | 13.59 | 38.04 | 58.78 | 72.16 | 80.46 | 83.85 | 84.73 | 85.21 | **85.54** | **86.91** | **88.00** | **88.88** | **89.75** | **90.37** | **90.82** | **91.15** | **91.40** | **91.59** | **91.73** | **91.84** | **91.93** | **92.01** | **92.07** | **92.12** | **92.17** | **92.20** | **92.22** | **92.24** | **92.26** | **92.28** |
| 2004 | 11.04 | 38.31 | 57.01 | 68.92 | 73.91 | 75.16 | 75.81 | **76.27** | **78.58** | **80.49** | **82.07** | **83.62** | **84.74** | **85.53** | **86.11** | **86.54** | **86.86** | **87.10** | **87.29** | **87.44** | **87.57** | **87.67** | **87.75** | **87.83** | **87.88** | **87.91** | **87.95** | **87.98** | **88.00** | **88.02** |
| 2005 | 14.55 | 35.66 | 49.96 | 58.09 | 59.94 | 60.78 | **61.36** | **64.10** | **66.62** | **69.01** | **71.54** | **73.53** | **75.02** | **76.15** | **77.02** | **77.69** | **78.21** | **78.63** | **78.98** | **79.26** | **79.50** | **79.70** | **79.87** | **80.00** | **80.09** | **80.17** | **80.24** | **80.30** | **80.35** | **80.40** |
| 2006 | 7.09 | 22.25 | 35.56 | 42.37 | 44.25 | **44.87** | **48.06** | **51.07** | **54.18** | **57.87** | **60.81** | **63.03** | **64.70** | **65.97** | **66.93** | **67.67** | **68.26** | **68.74** | **69.12** | **69.45** | **69.72** | **69.94** | **70.11** | **70.23** | **70.33** | **70.42** | **70.51** | **70.58** | **70.64** | **70.69** |
| 2007 | 6.46 | 24.24 | 40.07 | 44.68 | **45.56** | **48.11** | **50.50** | **53.01** | **56.09** | **58.89** | **61.14** | **62.82** | **64.06** | **64.98** | **65.69** | **66.24** | **66.68** | **67.04** | **67.33** | **67.57** | **67.77** | **67.91** | **68.02** | **68.11** | **68.19** | **68.26** | **68.32** | **68.37** | **68.42** | **68.46** |
| 2008 | 3.47 | 31.71 | 38.02 | **40.10** | **42.28** | **44.13** | **46.20** | **48.78** | **51.17** | **53.47** | **55.33** | **56.72** | **57.77** | **58.56** | **59.17** | **59.65** | **60.03** | **60.34** | **60.59** | **60.80** | **60.95** | **61.06** | **61.15** | **61.23** | **61.30** | **61.36** | **61.42** | **61.46** | **61.51** | **61.54** |
| 2009 | 2.49 | 12.70 | **19.24** | **25.90** | **30.80** | **35.67** | **41.64** | **46.84** | **51.22** | **54.82** | **57.41** | **59.21** | **60.47** | **61.39** | **62.08** | **62.59** | **62.99** | **63.30** | **63.55** | **63.72** | **63.84** | **63.94** | **64.02** | **64.10** | **64.16** | **64.22** | **64.26** | **64.31** | **64.34** | **64.38** |
| 2010 | 3.67 | **11.99** | **22.65** | **30.14** | **36.86** | **44.80** | **51.50** | **56.95** | **61.27** | **64.46** | **66.62** | **68.08** | **69.10** | **69.83** | **70.38** | **70.78** | **71.09** | **71.33** | **71.49** | **71.61** | **71.70** | **71.78** | **71.85** | **71.91** | **71.96** | **72.00** | **72.04** | **72.07** | **72.10** | **72.13** |
| 2011 | **1.05** | **18.04** | **31.04** | **41.52** | **52.08** | **60.56** | **67.18** | **72.18** | **75.78** | **78.25** | **79.81** | **80.83** | **81.51** | **81.97** | **82.30** | **82.54** | **82.72** | **82.84** | **82.92** | **82.98** | **83.03** | **83.08** | **83.12** | **83.15** | **83.18** | **83.20** | **83.22** | **83.24** | **83.26** | **83.27** |
| 2012 | **6.19** | **25.94** | **41.78** | **55.56** | **64.88** | **71.91** | **77.11** | **80.85** | **83.44** | **85.18** | **86.28** | **86.99** | **87.46** | **87.78** | **88.01** | **88.18** | **88.28** | **88.36** | **88.41** | **88.46** | **88.50** | **88.54** | **88.57** | **88.59** | **88.61** | **88.63** | **88.65** | **88.66** | **88.67** | **88.68** |
| 2013 | **6.88** | **34.16** | **56.68** | **69.12** | **76.61** | **81.91** | **85.65** | **88.22** | **89.96** | **91.13** | **91.86** | **92.34** | **92.65** | **92.87** | **93.03** | **93.13** | **93.20** | **93.25** | **93.30** | **93.33** | **93.36** | **93.39** | **93.41** | **93.43** | **93.45** | **93.46** | **93.48** | **93.49** | **93.50** | **93.50** |
| 2014 | **6.71** | **41.65** | **64.11** | **75.34** | **81.65** | **85.94** | **88.92** | **90.98** | **92.39** | **93.37** | **93.99** | **94.38** | **94.65** | **94.84** | **94.96** | **95.03** | **95.09** | **95.14** | **95.18** | **95.21** | **95.24** | **95.27** | **95.29** | **95.30** | **95.32** | **95.33** | **95.34** | **95.35** | **95.36** | **95.37** |
| 2015 | **10.30** | **45.88** | **66.33** | **76.69** | **82.60** | **86.63** | **89.45** | **91.41** | **92.78** | **93.72** | **94.31** | **94.69** | **94.94** | **95.10** | **95.19** | **95.27** | **95.33** | **95.38** | **95.42** | **95.45** | **95.48** | **95.50** | **95.52** | **95.54** | **95.55** | **95.57** | **95.58** | **95.59** | **95.60** | **95.60** |
| 2016 | **11.08** | **46.20** | **65.83** | **75.93** | **81.76** | **85.81** | **88.72** | **90.80** | **92.27** | **93.26** | **93.89** | **94.28** | **94.51** | **94.65** | **94.76** | **94.85** | **94.91** | **94.97** | **95.01** | **95.05** | **95.08** | **95.10** | **95.12** | **95.14** | **95.16** | **95.17** | **95.19** | **95.20** | **95.21** | **95.21** |
| 2017 | **10.47** | **44.67** | **64.22** | **74.33** | **80.24** | **84.48** | **87.59** | **89.85** | **91.46** | **92.55** | **93.23** | **93.60** | **93.82** | **93.99** | **94.11** | **94.21** | **94.29** | **94.35** | **94.40** | **94.44** | **94.48** | **94.51** | **94.53** | **94.55** | **94.57** | **94.59** | **94.60** | **94.61** | **94.62** | **94.63** |
| 2018 | **9.88** | **43.02** | **62.36** | **72.53** | **78.68** | **83.17** | **86.52** | **88.98** | **90.72** | **91.90** | **92.54** | **92.90** | **93.16** | **93.35** | **93.50** | **93.61** | **93.70** | **93.78** | **93.83** | **93.88** | **93.92** | **93.96** | **93.98** | **94.01** | **94.03** | **94.05** | **94.06** | **94.08** | **94.09** | **94.10** |

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1982 | 79.10 | 78.22 | 76.72 | 76.51 | 78.49 | 79.51 | 83.63 | 89.21 | 98.47 | 100.06 | 99.67 | 103.24 | 106.37 | 108.83 | 105.44 | 103.34 | 100.46 | 107.81 | 104.02 | 100.48 | 99.14 | 95.33 | 108.92 | 110.51 | 117.43 | 131.24 | 161.53 | 140.25 | 156.05 | **137.54** |
| 1983 | 79.00 | 77.01 | 75.90 | 77.13 | 78.25 | 81.84 | 85.59 | 95.52 | 96.08 | 92.89 | 97.46 | 101.78 | 105.86 | 104.56 | 102.93 | 99.14 | 98.77 | 100.71 | 101.59 | 99.96 | 97.20 | 99.89 | 103.65 | 105.70 | 119.81 | 133.40 | 128.59 | 140.23 | **128.64** | **108.80** |
| 1984 | 72.47 | 74.10 | 74.71 | 75.35 | 78.83 | 81.65 | 92.54 | 92.36 | 90.32 | 90.75 | 97.26 | 104.34 | 103.32 | 100.18 | 98.04 | 98.08 | 98.11 | 102.75 | 97.27 | 99.38 | 99.31 | 101.03 | 110.98 | 123.00 | 140.90 | 140.25 | 135.40 | **124.12** | **110.03** | **96.08** |
| 1985 | 70.20 | 73.51 | 74.40 | 77.07 | 81.00 | 89.94 | 89.29 | 86.63 | 88.38 | 90.57 | 100.01 | 104.52 | 101.11 | 97.90 | 98.10 | 96.45 | 99.50 | 95.49 | 96.28 | 95.30 | 98.78 | 109.96 | 114.85 | 134.47 | 134.29 | 141.00 | **128.75** | **109.27** | **95.55** | **90.53** |
| 1986 | 34.86 | 39.78 | 41.96 | 45.19 | 54.12 | 52.96 | 50.06 | 51.33 | 53.73 | 59.30 | 63.41 | 65.12 | 60.68 | 59.62 | 58.11 | 61.27 | 58.38 | 57.90 | 56.76 | 60.57 | 64.98 | 78.26 | 99.17 | 96.61 | 92.23 | **83.47** | **74.05** | **60.10** | **55.41** | **57.02** |
| 1987 | 34.98 | 40.31 | 43.47 | 52.34 | 51.42 | 47.53 | 48.22 | 50.43 | 56.72 | 57.25 | 61.21 | 60.15 | 58.62 | 57.85 | 60.10 | 57.49 | 57.31 | 57.37 | 60.58 | 67.79 | 81.96 | 93.99 | 92.93 | 94.46 | **86.65** | **74.19** | **60.45** | **55.88** | **57.61** | **60.38** |
| 1988 | 38.16 | 43.29 | 51.30 | 49.59 | 46.46 | 47.00 | 50.01 | 57.39 | 59.46 | 58.82 | 60.47 | 62.96 | 60.78 | 63.25 | 58.69 | 59.30 | 58.98 | 61.95 | 65.62 | 84.83 | 95.30 | 97.55 | 94.08 | **88.81** | **75.84** | **62.28** | **57.72** | **59.49** | **62.52** | **63.85** |
| 1989 | 40.37 | 52.51 | 48.89 | 45.71 | 46.91 | 50.17 | 57.91 | 60.22 | 60.83 | 58.92 | 63.62 | 66.37 | 65.26 | 60.82 | 60.34 | 59.86 | 64.32 | 69.90 | 88.37 | 98.65 | 96.51 | 94.27 | **88.99** | **77.32** | **63.85** | **59.21** | **60.98** | **64.10** | **65.38** | **65.34** |
| 1990 | 51.75 | 47.36 | 44.69 | 45.51 | 49.16 | 56.66 | 59.44 | 60.15 | 60.70 | 62.38 | 67.37 | 70.91 | 64.28 | 64.03 | 62.95 | 67.06 | 71.88 | 87.03 | 99.72 | 97.69 | 94.50 | **90.48** | **79.39** | **66.39** | **61.56** | **63.23** | **66.36** | **67.62** | **67.65** | **67.93** |
| 1991 | 42.86 | 42.79 | 43.21 | 47.23 | 54.51 | 56.62 | 56.85 | 57.95 | 60.23 | 60.70 | 65.77 | 64.02 | 63.30 | 63.59 | 68.66 | 73.84 | 89.96 | 101.76 | 102.50 | 98.38 | **91.38** | **79.45** | **66.80** | **62.03** | **63.70** | **66.83** | **68.05** | **68.03** | **68.14** | **68.08** |
| 1992 | 30.74 | 31.59 | 34.91 | 41.21 | 42.52 | 42.10 | 43.03 | 46.08 | 46.46 | 48.49 | 48.87 | 51.68 | 51.54 | 54.82 | 60.71 | 77.68 | 90.03 | 87.22 | 86.58 | **77.74** | **68.08** | **55.57** | **51.08** | **52.87** | **56.10** | **57.36** | **57.38** | **57.35** | **57.34** | **57.24** |
| 1993 | 24.84 | 31.91 | 36.14 | 37.98 | 37.82 | 38.33 | 41.10 | 42.34 | 45.32 | 41.32 | 46.66 | 51.15 | 55.12 | 60.03 | 76.62 | 87.41 | 88.69 | 85.22 | **77.77** | **66.15** | **54.83** | **50.16** | **51.86** | **55.14** | **56.49** | **56.45** | **56.44** | **56.44** | **56.43** | **56.29** |
| 1994 | 27.23 | 33.35 | 36.51 | 36.38 | 36.65 | 38.83 | 39.44 | 42.33 | 39.97 | 40.95 | 46.73 | 54.25 | 58.61 | 76.62 | 87.90 | 84.89 | 83.73 | **77.50** | **67.01** | **54.64** | **49.98** | **51.66** | **54.98** | **56.27** | **56.29** | **56.32** | **56.34** | **56.34** | **56.38** | **56.55** |
| 1995 | 33.14 | 37.81 | 35.69 | 36.01 | 37.95 | 37.92 | 40.54 | 37.93 | 40.27 | 40.55 | 48.92 | 58.65 | 76.13 | 86.52 | 85.72 | 84.48 | **77.30** | **66.79** | **55.58** | **51.13** | **53.00** | **56.26** | **57.50** | **57.50** | **57.45** | **57.40** | **57.31** | **57.17** | **57.11** | **56.97** |
| 1996 | 32.46 | 31.89 | 32.81 | 34.91 | 35.60 | 38.52 | 35.32 | 37.02 | 38.14 | 43.34 | 55.23 | 75.44 | 86.46 | 86.24 | 83.44 | **79.12** | **67.04** | **55.75** | **51.07** | **52.82** | **55.99** | **57.31** | **57.28** | **57.24** | **57.21** | **57.16** | **57.09** | **57.08** | **57.07** | **57.08** |
| 1997 | 26.65 | 30.72 | 32.06 | 33.62 | 37.02 | 33.96 | 35.28 | 36.95 | 42.58 | 48.50 | 72.43 | 88.83 | 88.23 | 85.48 | **79.69** | **69.37** | **57.16** | **52.27** | **53.99** | **57.17** | **58.46** | **58.44** | **58.42** | **58.40** | **58.34** | **58.24** | **58.20** | **58.16** | **58.11** | **58.02** |
| 1998 | 26.27 | 31.34 | 31.13 | 34.40 | 32.15 | 33.28 | 33.91 | 39.84 | 46.59 | 65.59 | 83.14 | 89.58 | 86.51 | **78.92** | **69.96** | **57.31** | **51.66** | **52.96** | **56.06** | **57.32** | **57.24** | **57.21** | **57.16** | **57.13** | **57.14** | **57.12** | **57.08** | **57.02** | **56.94** | **56.77** |
| 1999 | 28.32 | 30.10 | 32.67 | 30.31 | 31.79 | 32.02 | 37.42 | 44.96 | 63.35 | 77.95 | 85.92 | 87.30 | **82.08** | **71.54** | **58.84** | **52.18** | **53.05** | **56.02** | **57.21** | **57.16** | **57.15** | **57.13** | **57.10** | **57.11** | **57.11** | **57.09** | **57.06** | **57.02** | **56.98** | **55.62** |
| 2000 | 26.74 | 32.11 | 30.79 | 33.11 | 32.72 | 37.36 | 43.90 | 62.79 | 79.94 | 82.84 | 87.32 | **87.38** | **77.46** | **63.22** | **55.76** | **55.64** | **58.34** | **59.36** | **59.32** | **59.32** | **59.34** | **59.33** | **59.27** | **59.25** | **59.25** | **59.24** | **59.22** | **59.20** | **57.73** | **55.46** |
| 2001 | 28.96 | 30.88 | 32.43 | 32.90 | 37.12 | 42.88 | 61.63 | 77.13 | 82.39 | 82.84 | **84.03** | **80.55** | **67.43** | **57.92** | **56.27** | **57.93** | **58.80** | **58.51** | **58.48** | **58.43** | **58.42** | **58.44** | **58.44** | **58.43** | **58.40** | **58.36** | **58.31** | **56.65** | **54.41** | **54.26** |
| 2002 | 24.79 | 30.91 | 31.64 | 36.51 | 42.51 | 60.24 | 75.50 | 80.36 | 81.77 | **79.82** | **78.83** | **69.50** | **60.01** | **56.75** | **57.47** | **57.74** | **57.42** | **57.29** | **57.23** | **57.15** | **57.18** | **57.18** | **57.17** | **57.15** | **57.11** | **57.07** | **55.37** | **53.22** | **53.19** | **53.10** |
| 2003 | 25.85 | 30.63 | 34.79 | 41.37 | 58.97 | 73.65 | 78.61 | 79.87 | **78.04** | **72.75** | **66.64** | **60.94** | **56.75** | **56.66** | **56.02** | **55.55** | **55.29** | **55.26** | **55.27** | **55.28** | **55.26** | **55.23** | **55.20** | **55.16** | **55.11** | **53.36** | **51.27** | **51.24** | **51.19** | **51.09** |
| 2004 | 26.88 | 33.10 | 39.67 | 58.02 | 71.99 | 76.17 | 77.60 | **76.48** | **72.08** | **61.24** | **60.15** | **59.05** | **58.01** | **56.38** | **55.19** | **54.71** | **54.53** | **54.51** | **54.49** | **54.48** | **54.45** | **54.42** | **54.38** | **54.33** | **52.57** | **50.50** | **50.48** | **50.46** | **50.44** | **50.44** |
| 2005 | 30.46 | 36.74 | 54.78 | 67.48 | 70.82 | 71.32 | **70.05** | **66.89** | **57.86** | **52.69** | **57.42** | **60.36** | **57.85** | **54.46** | **52.46** | **51.42** | **50.89** | **50.60** | **50.39** | **50.25** | **50.18** | **50.12** | **50.05** | **48.40** | **46.17** | **46.13** | **46.06** | **45.97** | **45.79** | **45.28** |
| 2006 | 32.30 | 56.38 | 65.53 | 68.08 | 68.56 | **67.11** | **64.01** | **56.19** | **53.05** | **55.15** | **62.09** | **64.32** | **61.15** | **57.64** | **54.67** | **52.82** | **51.64** | **50.81** | **50.21** | **49.82** | **49.58** | **49.48** | **47.81** | **45.66** | **45.64** | **45.63** | **45.61** | **45.59** | **45.57** | **45.55** |
| 2007 | 54.01 | 64.95 | 65.94 | 66.33 | **65.54** | **62.12** | **54.22** | **52.35** | **55.81** | **59.52** | **64.95** | **66.88** | **63.16** | **59.83** | **56.63** | **54.64** | **53.21** | **52.18** | **51.51** | **51.06** | **50.87** | **49.11** | **46.99** | **46.97** | **46.94** | **46.93** | **46.92** | **46.90** | **46.89** | **46.88** |
| 2008 | 61.26 | 60.47 | 62.47 | **61.77** | **58.46** | **49.80** | **47.69** | **51.97** | **56.68** | **58.39** | **62.25** | **64.07** | **60.11** | **57.10** | **54.41** | **52.73** | **51.67** | **51.10** | **50.83** | **50.71** | **48.92** | **46.86** | **46.84** | **46.80** | **46.76** | **46.72** | **46.69** | **46.62** | **46.52** | **46.33** |
| 2009 | 46.48 | 56.89 | **55.73** | **51.73** | **42.65** | **40.05** | **43.49** | **47.98** | **49.65** | **49.47** | **52.85** | **53.93** | **51.32** | **49.07** | **47.84** | **47.38** | **47.22** | **47.15** | **47.08** | **45.26** | **43.29** | **43.27** | **43.24** | **43.20** | **43.16** | **43.12** | **43.05** | **42.95** | **42.87** | **42.69** |
| 2010 | 46.37 | **51.62** | **45.83** | **37.05** | **34.68** | **37.24** | **40.86** | **42.27** | **42.60** | **41.82** | **46.36** | **48.16** | **45.89** | **45.09** | **44.83** | **44.68** | **44.58** | **44.49** | **42.59** | **40.71** | **40.66** | **40.59** | **40.51** | **40.42** | **40.33** | **40.24** | **40.16** | **40.07** | **39.96** | **39.79** |
| 2011 | **43.28** | **39.27** | **32.51** | **30.21** | **32.69** | **35.36** | **36.60** | **37.04** | **37.47** | **37.75** | **42.97** | **45.28** | **44.30** | **44.01** | **43.82** | **43.68** | **43.55** | **41.60** | **39.71** | **39.63** | **39.54** | **39.43** | **39.33** | **39.22** | **39.12** | **39.03** | **38.91** | **38.84** | **38.79** | **38.86** |
| 2012 | **31.53** | **28.51** | **26.75** | **29.54** | **32.78** | **33.77** | **34.46** | **35.50** | **36.72** | **37.38** | **42.42** | **45.82** | **44.74** | **44.48** | **44.35** | **44.25** | **42.31** | **40.44** | **40.39** | **40.32** | **40.25** | **40.19** | **40.12** | **40.07** | **40.01** | **39.97** | **39.93** | **39.93** | **39.92** | **39.96** |
| 2013 | **23.69** | **24.66** | **28.35** | **32.71** | **34.13** | **34.59** | **35.25** | **36.55** | **37.94** | **38.35** | **43.30** | **46.54** | **45.34** | **45.06** | **44.97** | **43.05** | **41.22** | **41.21** | **41.17** | **41.12** | **41.08** | **41.04** | **41.00** | **40.97** | **40.96** | **40.93** | **40.93** | **40.92** | **40.92** | **40.94** |
| 2014 | **22.71** | **27.67** | **33.29** | **35.39** | **36.20** | **36.69** | **37.35** | **38.52** | **39.69** | **40.23** | **44.93** | **48.33** | **47.23** | **46.81** | **44.72** | **42.82** | **42.77** | **42.71** | **42.65** | **42.58** | **42.52** | **42.46** | **42.40** | **42.35** | **42.31** | **42.26** | **42.22** | **42.25** | **42.26** | **42.32** |
| 2015 | **24.92** | **32.95** | **35.50** | **36.86** | **37.69** | **38.22** | **38.86** | **40.05** | **40.93** | **41.84** | **46.55** | **49.72** | **48.76** | **46.36** | **44.40** | **44.29** | **44.22** | **44.16** | **44.09** | **44.01** | **43.94** | **43.89** | **43.83** | **43.78** | **43.72** | **43.70** | **43.74** | **43.71** | **43.72** | **43.73** |
| 2016 | **29.50** | **33.60** | **35.75** | **37.23** | **38.25** | **38.36** | **39.38** | **40.64** | **41.19** | **42.23** | **46.97** | **49.88** | **46.91** | **44.63** | **44.46** | **44.35** | **44.29** | **44.22** | **44.14** | **44.06** | **43.99** | **43.93** | **43.87** | **43.82** | **43.83** | **43.82** | **43.78** | **43.78** | **43.77** | **43.79** |
| 2017 | **29.60** | **33.81** | **35.71** | **37.61** | **38.79** | **38.65** | **39.72** | **40.87** | **41.60** | **42.49** | **46.88** | **47.77** | **44.83** | **44.32** | **44.12** | **44.00** | **43.93** | **43.87** | **43.79** | **43.72** | **43.64** | **43.57** | **43.50** | **43.46** | **43.45** | **43.45** | **43.43** | **43.42** | **43.42** | **43.44** |
| 2018 | **29.56** | **33.77** | **35.59** | **37.64** | **38.71** | **38.87** | **39.81** | **40.86** | **41.67** | **42.56** | **45.21** | **45.96** | **44.73** | **44.20** | **43.97** | **43.85** | **43.78** | **43.70** | **43.65** | **43.58** | **43.51** | **43.47** | **43.44** | **43.40** | **43.35** | **43.28** | **43.23** | **43.21** | **43.20** | **43.23** |

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1982 | 79.08 | 78.17 | 76.69 | 76.48 | 78.48 | 79.49 | 83.60 | 89.16 | 98.46 | 100.02 | 99.61 | 103.22 | 106.37 | 108.83 | 105.44 | 103.33 | 100.46 | 107.81 | 104.02 | 100.48 | 99.14 | 95.33 | 108.92 | 110.51 | 117.43 | 131.24 | 161.53 | 140.25 | 156.05 | **137.54** |
| 1983 | 78.16 | 76.73 | 75.52 | 76.71 | 77.93 | 81.64 | 85.40 | 95.41 | 96.01 | 92.84 | 97.43 | 101.69 | 105.85 | 104.53 | 102.90 | 99.14 | 98.77 | 100.71 | 101.59 | 99.96 | 97.20 | 99.89 | 103.65 | 105.70 | 119.81 | 133.40 | 128.59 | 140.23 | **128.64** | **108.80** |
| 1984 | 72.20 | 73.77 | 74.37 | 74.99 | 78.43 | 81.41 | 92.30 | 92.15 | 90.17 | 90.63 | 97.11 | 104.17 | 103.15 | 100.12 | 97.99 | 98.03 | 98.11 | 102.75 | 97.27 | 99.38 | 99.31 | 101.03 | 110.98 | 123.00 | 140.90 | 140.25 | 135.40 | **124.12** | **110.03** | **96.08** |
| 1985 | 70.12 | 73.19 | 73.94 | 76.60 | 80.60 | 89.55 | 89.09 | 86.41 | 88.21 | 90.39 | 99.68 | 104.17 | 100.90 | 97.75 | 97.95 | 96.40 | 99.50 | 95.49 | 96.28 | 95.30 | 98.78 | 109.96 | 114.85 | 134.47 | 134.29 | 141.00 | **128.75** | **109.27** | **95.55** | **90.53** |
| 1986 | 34.67 | 39.32 | 41.56 | 44.77 | 53.79 | 52.72 | 49.87 | 51.20 | 53.63 | 59.15 | 63.28 | 65.05 | 60.60 | 59.55 | 58.02 | 61.27 | 58.38 | 57.90 | 56.76 | 60.57 | 64.98 | 78.26 | 99.17 | 96.61 | 92.23 | **83.47** | **74.05** | **60.10** | **55.41** | **57.02** |
| 1987 | 34.70 | 39.99 | 43.16 | 52.09 | 51.19 | 47.36 | 48.05 | 50.26 | 56.55 | 57.13 | 61.09 | 60.05 | 58.57 | 57.81 | 60.05 | 57.47 | 57.31 | 57.37 | 60.58 | 67.79 | 81.96 | 93.99 | 92.93 | 94.46 | **86.65** | **74.19** | **60.45** | **55.88** | **57.61** | **60.38** |
| 1988 | 37.88 | 43.04 | 51.00 | 49.25 | 46.09 | 46.62 | 49.61 | 56.95 | 59.07 | 58.63 | 60.26 | 62.84 | 60.71 | 63.13 | 58.66 | 59.30 | 58.98 | 61.95 | 65.62 | 84.83 | 95.30 | 97.55 | 94.08 | **88.81** | **75.84** | **62.28** | **57.72** | **59.49** | **62.52** | **63.85** |
| 1989 | 40.09 | 52.26 | 48.58 | 45.36 | 46.47 | 49.64 | 57.37 | 59.70 | 60.46 | 58.65 | 63.41 | 66.20 | 65.16 | 60.74 | 60.31 | 59.86 | 64.32 | 69.90 | 88.37 | 98.65 | 96.51 | 94.27 | **88.99** | **77.32** | **63.85** | **59.21** | **60.98** | **64.10** | **65.38** | **65.34** |
| 1990 | 53.04 | 47.27 | 44.42 | 45.24 | 48.87 | 56.19 | 58.96 | 59.99 | 60.50 | 62.37 | 67.47 | 70.85 | 64.29 | 63.89 | 63.25 | 67.02 | 71.97 | 87.09 | 99.72 | 97.69 | 94.51 | **90.49** | **79.40** | **66.40** | **61.58** | **63.26** | **66.38** | **67.64** | **67.67** | **67.96** |
| 1991 | 43.31 | 42.66 | 43.04 | 47.00 | 54.13 | 56.24 | 56.81 | 57.97 | 60.41 | 60.94 | 66.31 | 63.76 | 63.31 | 63.92 | 68.68 | 74.13 | 90.38 | 101.42 | 102.64 | 98.33 | **91.32** | **79.55** | **66.89** | **62.12** | **63.81** | **66.93** | **68.14** | **68.12** | **68.24** | **68.18** |
| 1992 | 32.33 | 31.75 | 35.16 | 41.47 | 42.87 | 42.36 | 43.32 | 46.75 | 46.90 | 48.93 | 49.41 | 51.45 | 51.91 | 55.12 | 61.30 | 78.34 | 89.88 | 87.07 | 86.13 | **77.55** | **68.25** | **55.72** | **51.30** | **53.17** | **56.37** | **57.62** | **57.62** | **57.58** | **57.55** | **57.42** |
| 1993 | 29.55 | 36.31 | 39.65 | 40.78 | 40.15 | 40.29 | 42.59 | 43.83 | 46.87 | 42.44 | 47.44 | 51.45 | 55.64 | 59.90 | 76.40 | 87.47 | 88.49 | 85.82 | **78.71** | **66.59** | **55.21** | **50.66** | **52.46** | **55.67** | **57.01** | **56.94** | **56.89** | **56.87** | **56.83** | **56.66** |
| 1994 | 33.59 | 37.71 | 39.92 | 38.73 | 38.48 | 40.80 | 41.60 | 44.04 | 41.45 | 41.81 | 47.11 | 54.61 | 59.79 | 76.88 | 88.01 | 85.66 | 84.16 | **77.75** | **67.35** | **55.15** | **50.54** | **52.31** | **55.59** | **56.83** | **56.82** | **56.83** | **56.81** | **56.76** | **56.77** | **56.91** |
| 1995 | 32.15 | 38.83 | 36.20 | 36.41 | 38.37 | 38.58 | 41.46 | 38.72 | 40.22 | 40.75 | 48.94 | 58.87 | 75.58 | 86.37 | 85.32 | 84.20 | **76.76** | **66.73** | **55.52** | **51.09** | **52.97** | **56.23** | **57.46** | **57.46** | **57.40** | **57.34** | **57.24** | **57.10** | **57.04** | **56.91** |
| 1996 | 37.43 | 33.15 | 33.70 | 35.76 | 36.40 | 39.06 | 36.11 | 37.07 | 38.22 | 43.59 | 55.25 | 75.53 | 86.99 | 86.05 | 83.17 | **78.92** | **67.08** | **55.82** | **51.14** | **52.90** | **56.05** | **57.36** | **57.31** | **57.26** | **57.22** | **57.16** | **57.08** | **57.08** | **57.07** | **57.08** |
| 1997 | 26.31 | 31.36 | 32.96 | 34.77 | 38.04 | 34.65 | 35.83 | 36.95 | 42.84 | 48.26 | 72.43 | 89.06 | 87.83 | 85.10 | **79.99** | **69.53** | **57.16** | **52.25** | **53.98** | **57.13** | **58.40** | **58.37** | **58.34** | **58.31** | **58.24** | **58.14** | **58.11** | **58.07** | **58.03** | **57.94** |
| 1998 | 26.61 | 32.61 | 32.50 | 35.18 | 32.88 | 33.68 | 33.94 | 40.13 | 46.55 | 65.79 | 82.99 | 89.75 | 86.96 | **79.03** | **70.05** | **57.44** | **51.72** | **52.98** | **56.06** | **57.31** | **57.21** | **57.18** | **57.13** | **57.10** | **57.12** | **57.10** | **57.07** | **57.01** | **56.93** | **56.76** |
| 1999 | 30.88 | 31.01 | 33.14 | 30.95 | 32.10 | 32.21 | 37.63 | 45.22 | 63.69 | 78.23 | 86.22 | 87.57 | **82.28** | **71.75** | **59.13** | **52.40** | **53.26** | **56.20** | **57.37** | **57.30** | **57.29** | **57.26** | **57.22** | **57.22** | **57.21** | **57.19** | **57.15** | **57.10** | **57.06** | **55.68** |
| 2000 | 27.46 | 32.19 | 30.85 | 33.11 | 32.73 | 37.42 | 44.03 | 62.79 | 80.22 | 83.20 | 87.66 | **87.71** | **77.79** | **63.46** | **56.03** | **55.89** | **58.53** | **59.52** | **59.47** | **59.46** | **59.47** | **59.44** | **59.36** | **59.34** | **59.33** | **59.32** | **59.29** | **59.27** | **57.77** | **55.51** |
| 2001 | 29.55 | 31.28 | 32.88 | 33.33 | 37.55 | 43.35 | 62.00 | 77.58 | 82.75 | 83.10 | **84.46** | **80.63** | **67.54** | **58.03** | **56.46** | **58.12** | **58.98** | **58.68** | **58.63** | **58.57** | **58.56** | **58.56** | **58.55** | **58.54** | **58.50** | **58.46** | **58.40** | **56.73** | **54.50** | **54.35** |
| 2002 | 26.79 | 31.82 | 32.26 | 37.12 | 43.03 | 60.67 | 75.91 | 80.69 | 82.02 | **80.14** | **79.06** | **69.73** | **60.39** | **57.09** | **57.77** | **57.97** | **57.62** | **57.48** | **57.40** | **57.31** | **57.32** | **57.32** | **57.30** | **57.26** | **57.22** | **57.17** | **55.44** | **53.31** | **53.28** | **53.18** |
| 2003 | 27.29 | 32.15 | 36.10 | 42.60 | 59.73 | 74.56 | 79.58 | 80.93 | **78.97** | **73.55** | **67.34** | **61.63** | **57.31** | **57.16** | **56.35** | **55.88** | **55.58** | **55.53** | **55.52** | **55.52** | **55.48** | **55.44** | **55.39** | **55.34** | **55.27** | **53.49** | **51.44** | **51.41** | **51.35** | **51.24** |
| 2004 | 28.40 | 34.70 | 40.66 | 59.00 | 72.67 | 76.91 | 78.65 | **77.57** | **73.14** | **62.12** | **61.07** | **60.11** | **58.77** | **56.87** | **55.54** | **55.00** | **54.79** | **54.75** | **54.71** | **54.68** | **54.64** | **54.59** | **54.54** | **54.48** | **52.68** | **50.66** | **50.64** | **50.61** | **50.58** | **50.57** |
| 2005 | 31.83 | 37.24 | 55.02 | 67.51 | 70.82 | 71.37 | **70.29** | **67.15** | **58.21** | **53.17** | **58.04** | **60.96** | **58.37** | **54.73** | **52.56** | **51.44** | **50.86** | **50.53** | **50.31** | **50.16** | **50.09** | **50.03** | **49.96** | **48.30** | **46.13** | **46.10** | **46.03** | **45.93** | **45.75** | **45.23** |
| 2006 | 34.40 | 56.71 | 65.65 | 68.12 | 68.70 | **67.27** | **64.26** | **56.52** | **53.43** | **55.66** | **62.49** | **64.66** | **61.47** | **57.88** | **54.83** | **52.93** | **51.71** | **50.85** | **50.23** | **49.84** | **49.58** | **49.48** | **47.80** | **45.67** | **45.65** | **45.64** | **45.62** | **45.60** | **45.58** | **45.56** |
| 2007 | 54.76 | 65.09 | 66.00 | 66.33 | **65.66** | **62.28** | **54.40** | **52.56** | **56.08** | **59.77** | **65.17** | **67.05** | **63.30** | **59.95** | **56.71** | **54.70** | **53.26** | **52.22** | **51.54** | **51.09** | **50.89** | **49.12** | **47.01** | **46.99** | **46.96** | **46.94** | **46.93** | **46.91** | **46.90** | **46.89** |
| 2008 | 61.30 | 60.91 | 62.63 | **61.83** | **58.60** | **49.95** | **47.87** | **52.24** | **56.95** | **58.61** | **62.46** | **64.21** | **60.21** | **57.18** | **54.47** | **52.79** | **51.72** | **51.14** | **50.87** | **50.75** | **48.95** | **46.90** | **46.87** | **46.83** | **46.79** | **46.75** | **46.71** | **46.64** | **46.54** | **46.34** |
| 2009 | 46.68 | 57.78 | **56.85** | **52.62** | **43.50** | **40.74** | **44.19** | **48.51** | **49.79** | **49.46** | **52.98** | **53.73** | **51.25** | **49.05** | **47.93** | **47.57** | **47.44** | **47.37** | **47.30** | **45.44** | **43.50** | **43.47** | **43.43** | **43.37** | **43.32** | **43.27** | **43.18** | **43.08** | **42.99** | **42.80** |
| 2010 | 48.31 | **52.15** | **45.86** | **37.04** | **34.42** | **36.72** | **40.11** | **41.22** | **41.62** | **40.82** | **45.52** | **47.63** | **45.48** | **44.89** | **44.79** | **44.71** | **44.63** | **44.55** | **42.64** | **40.79** | **40.75** | **40.67** | **40.59** | **40.50** | **40.41** | **40.32** | **40.23** | **40.14** | **40.04** | **39.87** |
| 2011 | **44.28** | **39.24** | **32.28** | **29.56** | **31.65** | **34.11** | **35.22** | **35.70** | **36.30** | **36.78** | **42.09** | **44.79** | **44.04** | **43.92** | **43.82** | **43.71** | **43.59** | **41.62** | **39.78** | **39.69** | **39.60** | **39.49** | **39.38** | **39.26** | **39.16** | **39.06** | **38.94** | **38.87** | **38.81** | **38.88** |
| 2012 | **30.82** | **27.63** | **25.78** | **28.72** | **32.09** | **33.15** | **33.89** | **34.93** | **36.17** | **36.82** | **41.89** | **45.48** | **44.48** | **44.31** | **44.25** | **44.20** | **42.27** | **40.42** | **40.37** | **40.31** | **40.24** | **40.17** | **40.11** | **40.05** | **40.00** | **39.95** | **39.91** | **39.91** | **39.91** | **39.94** |
| 2013 | **22.41** | **23.50** | **27.38** | **31.98** | **33.53** | **34.09** | **34.79** | **36.08** | **37.43** | **37.79** | **42.81** | **46.13** | **45.03** | **44.86** | **44.85** | **42.99** | **41.19** | **41.17** | **41.14** | **41.09** | **41.05** | **41.01** | **40.98** | **40.94** | **40.93** | **40.91** | **40.90** | **40.89** | **40.90** | **40.92** |
| 2014 | **21.22** | **26.42** | **32.30** | **34.64** | **35.63** | **36.26** | **36.96** | **38.12** | **39.21** | **39.71** | **44.47** | **47.93** | **46.94** | **46.63** | **44.62** | **42.79** | **42.75** | **42.69** | **42.63** | **42.56** | **42.49** | **42.44** | **42.38** | **42.33** | **42.29** | **42.23** | **42.20** | **42.23** | **42.23** | **42.29** |
| 2015 | **23.62** | **31.87** | **34.71** | **36.33** | **37.37** | **38.07** | **38.74** | **39.88** | **40.64** | **41.50** | **46.24** | **49.44** | **48.57** | **46.25** | **44.38** | **44.33** | **44.27** | **44.19** | **44.12** | **44.03** | **43.97** | **43.91** | **43.85** | **43.79** | **43.73** | **43.71** | **43.74** | **43.71** | **43.72** | **43.73** |
| 2016 | **28.30** | **32.62** | **35.02** | **36.80** | **38.05** | **38.26** | **39.35** | **40.55** | **40.94** | **41.94** | **46.68** | **49.65** | **46.75** | **44.57** | **44.47** | **44.41** | **44.34** | **44.27** | **44.18** | **44.10** | **44.02** | **43.96** | **43.90** | **43.84** | **43.85** | **43.83** | **43.79** | **43.79** | **43.78** | **43.79** |
| 2017 | **28.22** | **32.70** | **34.89** | **37.16** | **38.58** | **38.50** | **39.64** | **40.72** | **41.31** | **42.16** | **46.54** | **47.50** | **44.66** | **44.24** | **44.11** | **44.03** | **43.97** | **43.89** | **43.82** | **43.74** | **43.65** | **43.58** | **43.51** | **43.47** | **43.45** | **43.45** | **43.42** | **43.42** | **43.41** | **43.44** |
| 2018 | **28.17** | **32.73** | **34.82** | **37.25** | **38.53** | **38.78** | **39.75** | **40.73** | **41.41** | **42.25** | **44.92** | **45.74** | **44.59** | **44.13** | **43.97** | **43.89** | **43.82** | **43.73** | **43.67** | **43.60** | **43.53** | **43.48** | **43.45** | **43.40** | **43.36** | **43.28** | **43.22** | **43.21** | **43.20** | **43.22** |

**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 | 15.54 | 23.53 | 25.97 | 31.94 | 34.17 | 34.49 | 34.93 | 35.57 | 39.15 | 38.90 | 42.02 | 51.46 | 48.53 | 47.86 | 56.20 | 66.63 | 106.81 | 90.51 | 105.77 | **72.45** | **61.20** | **51.62** | **46.74** | **48.31** | **51.37** | **52.54** | **52.46** | **52.45** | **52.27** | **52.06** |
| 1993 | 15.46 | 24.34 | 28.97 | 31.58 | 32.45 | 33.13 | 36.04 | 36.73 | 39.43 | 37.23 | 42.41 | 48.06 | 51.11 | 58.91 | 75.99 | 87.41 | 90.32 | 80.85 | **74.04** | **61.74** | **50.68** | **46.21** | **47.86** | **50.80** | **51.97** | **51.80** | **51.69** | **51.60** | **51.50** | **51.41** |
| 1994 | 24.43 | 27.58 | 30.41 | 30.81 | 31.17 | 33.13 | 34.40 | 37.06 | 34.83 | 36.76 | 45.37 | 50.97 | 54.37 | 72.58 | 85.36 | 81.69 | 80.54 | **74.64** | **65.34** | **51.35** | **46.90** | **48.49** | **51.39** | **52.61** | **52.47** | **52.39** | **52.29** | **52.19** | **52.13** | **52.26** |
| 1995 | 23.36 | 27.57 | 29.00 | 29.37 | 32.35 | 30.19 | 34.73 | 33.08 | 36.42 | 37.48 | 50.15 | 61.76 | 75.89 | 88.39 | 98.51 | 87.56 | **75.72** | **67.29** | **54.49** | **50.27** | **52.18** | **55.47** | **56.69** | **56.66** | **56.77** | **56.49** | **56.29** | **55.89** | **55.55** | **54.89** |
| 1996 | 23.79 | 26.50 | 28.29 | 30.86 | 31.01 | 34.23 | 30.68 | 31.93 | 32.91 | 42.70 | 53.75 | 74.80 | 79.94 | 91.75 | 82.27 | **74.08** | **65.42** | **52.81** | **48.50** | **50.28** | **52.87** | **54.16** | **54.02** | **53.88** | **53.73** | **53.58** | **53.55** | **53.55** | **53.58** | **53.73** |
| 1997 | 32.54 | 25.38 | 27.78 | 26.27 | 28.18 | 25.34 | 26.20 | 32.09 | 40.45 | 40.90 | 85.67 | 93.87 | 94.35 | 80.47 | **81.09** | **68.54** | **54.23** | **49.66** | **51.41** | **54.14** | **55.30** | **55.11** | **54.95** | **54.74** | **54.55** | **54.32** | **54.22** | **54.14** | **54.04** | **53.92** |
| 1998 | 14.39 | 24.90 | 23.68 | 26.94 | 24.19 | 27.67 | 30.29 | 36.55 | 43.66 | 63.30 | 81.30 | 84.01 | 83.47 | **76.03** | **67.41** | **54.69** | **49.72** | **50.95** | **53.53** | **54.64** | **54.34** | **54.16** | **54.05** | **53.93** | **53.87** | **53.82** | **53.76** | **53.70** | **53.63** | **53.55** |
| 1999 | 20.37 | 23.80 | 27.52 | 23.17 | 27.29 | 28.85 | 33.28 | 40.87 | 60.18 | 73.29 | 83.30 | 84.41 | **79.19** | **67.88** | **54.89** | **49.36** | **50.32** | **52.95** | **54.14** | **53.92** | **53.76** | **53.60** | **53.42** | **53.40** | **53.34** | **53.26** | **53.20** | **53.16** | **53.14** | **52.17** |
| 2000 | 13.19 | 25.92 | 22.77 | 26.90 | 23.52 | 27.89 | 36.81 | 57.82 | 74.25 | 78.53 | 81.57 | **86.98** | **72.15** | **58.79** | **52.42** | **53.05** | **55.41** | **56.55** | **56.33** | **56.14** | **55.86** | **55.68** | **55.57** | **55.45** | **55.30** | **55.14** | **55.04** | **54.93** | **53.51** | **50.87** |
| 2001 | 16.78 | 26.14 | 28.29 | 28.77 | 32.62 | 38.20 | 57.15 | 73.08 | 79.42 | 80.26 | **80.44** | **79.88** | **66.45** | **57.04** | **54.47** | **55.22** | **55.67** | **55.23** | **55.04** | **54.87** | **54.69** | **54.62** | **54.57** | **54.49** | **54.39** | **54.29** | **54.23** | **52.82** | **50.36** | **50.33** |
| 2002 | 19.23 | 26.08 | 27.42 | 31.92 | 37.83 | 55.99 | 70.81 | 77.50 | 77.58 | **76.59** | **76.65** | **66.69** | **57.01** | **54.14** | **54.67** | **55.01** | **54.45** | **54.24** | **54.02** | **53.80** | **53.72** | **53.64** | **53.56** | **53.47** | **53.40** | **53.34** | **51.93** | **49.55** | **49.57** | **49.57** |
| 2003 | 22.55 | 25.72 | 30.02 | 36.66 | 55.03 | 70.04 | 74.66 | 76.18 | **74.49** | **69.51** | **63.56** | **57.92** | **54.15** | **53.79** | **53.50** | **52.80** | **52.48** | **52.33** | **52.26** | **52.18** | **52.06** | **51.96** | **51.87** | **51.80** | **51.71** | **50.26** | **47.91** | **47.91** | **47.88** | **47.82** |
| 2004 | 22.84 | 27.86 | 35.05 | 52.83 | 67.56 | 71.20 | 73.08 | **71.99** | **67.38** | **56.86** | **55.66** | **54.29** | **53.62** | **52.88** | **52.02** | **51.59** | **51.41** | **51.32** | **51.21** | **51.08** | **50.95** | **50.85** | **50.77** | **50.69** | **49.21** | **46.87** | **46.87** | **46.85** | **46.84** | **46.82** |
| 2005 | 21.63 | 30.58 | 48.81 | 62.84 | 66.47 | 68.35 | **65.82** | **62.29** | **53.16** | **47.61** | **51.83** | **55.49** | **53.77** | **51.66** | **50.60** | **50.02** | **49.85** | **49.68** | **49.52** | **49.37** | **49.22** | **49.12** | **49.03** | **47.63** | **45.16** | **45.12** | **45.08** | **45.02** | **44.91** | **44.58** |
| 2006 | 22.51 | 49.75 | 60.56 | 64.37 | 64.50 | **63.28** | **59.05** | **50.97** | **47.03** | **48.04** | **55.27** | **57.29** | **54.60** | **52.28** | **50.85** | **49.93** | **49.31** | **48.83** | **48.46** | **48.19** | **48.02** | **47.96** | **46.55** | **44.15** | **44.13** | **44.07** | **44.05** | **44.04** | **44.03** | **43.95** |
| 2007 | 47.54 | 60.07 | 62.29 | 64.17 | **61.76** | **57.95** | **50.93** | **48.71** | **51.81** | **54.97** | **60.17** | **62.45** | **59.25** | **56.46** | **54.17** | **52.69** | **51.36** | **50.35** | **49.65** | **49.12** | **48.86** | **47.33** | **44.96** | **44.98** | **44.96** | **44.96** | **44.97** | **44.97** | **44.98** | **45.00** |
| 2008 | 57.57 | 55.29 | 59.24 | **58.84** | **55.22** | **47.25** | **45.21** | **49.21** | **53.36** | **55.20** | **59.08** | **61.17** | **57.80** | **54.91** | **52.52** | **50.70** | **49.34** | **48.45** | **47.98** | **47.68** | **46.10** | **43.76** | **43.80** | **43.80** | **43.80** | **43.84** | **43.86** | **43.83** | **43.76** | **43.75** |
| 2009 | 45.79 | 54.06 | **52.70** | **49.08** | **40.50** | **38.47** | **42.14** | **46.79** | **49.17** | **49.33** | **52.18** | **54.54** | **51.42** | **48.93** | **46.97** | **45.65** | **44.93** | **44.54** | **44.30** | **42.70** | **40.46** | **40.43** | **40.41** | **40.39** | **40.38** | **40.37** | **40.37** | **40.36** | **40.35** | **40.33** |
| 2010 | 42.98 | **49.77** | **45.04** | **36.39** | **34.81** | **38.18** | **42.82** | **45.42** | **46.07** | **45.95** | **50.45** | **50.89** | **48.25** | **46.17** | **44.64** | **43.76** | **43.25** | **42.98** | **41.31** | **39.12** | **39.07** | **39.03** | **38.98** | **38.96** | **38.93** | **38.89** | **38.88** | **38.85** | **38.78** | **38.60** |
| 2011 | **43.21** | **38.06** | **31.68** | **30.58** | **34.11** | **37.77** | **39.66** | **40.47** | **40.71** | **40.41** | **45.92** | **46.70** | **44.68** | **43.47** | **42.83** | **42.47** | **42.24** | **40.53** | **38.35** | **38.30** | **38.26** | **38.20** | **38.16** | **38.12** | **38.08** | **38.06** | **38.01** | **38.00** | **38.01** | **38.07** |
| 2012 | **28.83** | **27.40** | **27.42** | **31.21** | **35.13** | **36.39** | **37.08** | **38.06** | **38.55** | **38.96** | **45.43** | **46.01** | **44.58** | **43.89** | **43.53** | **43.29** | **41.50** | **39.26** | **39.19** | **39.12** | **39.04** | **38.97** | **38.92** | **38.88** | **38.84** | **38.82** | **38.79** | **38.75** | **38.78** | **38.90** |
| 2013 | **21.11** | **23.66** | **27.40** | **31.62** | **33.41** | **33.80** | **34.84** | **36.20** | **37.44** | **38.12** | **44.43** | **46.32** | **45.36** | **45.05** | **44.83** | **43.05** | **40.80** | **40.74** | **40.68** | **40.60** | **40.51** | **40.44** | **40.38** | **40.32** | **40.28** | **40.22** | **40.21** | **40.21** | **40.24** | **40.31** |
| 2014 | **18.83** | **23.41** | **28.12** | **30.14** | **31.23** | **31.73** | **32.53** | **34.12** | **35.33** | **36.62** | **41.11** | **45.88** | **45.34** | **45.09** | **43.28** | **41.04** | **40.96** | **40.87** | **40.74** | **40.62** | **40.51** | **40.41** | **40.32** | **40.26** | **40.18** | **40.10** | **40.10** | **40.11** | **40.07** | **40.06** |
| 2015 | **17.72** | **26.53** | **28.47** | **29.81** | **30.87** | **31.29** | **32.09** | **33.47** | **34.94** | **36.26** | **41.69** | **45.38** | **44.79** | **42.86** | **40.61** | **40.52** | **40.43** | **40.33** | **40.21** | **40.11** | **40.01** | **39.92** | **39.83** | **39.79** | **39.72** | **39.69** | **39.74** | **39.71** | **39.71** | **39.76** |
| 2016 | **21.68** | **26.72** | **28.59** | **30.01** | **31.15** | **31.58** | **32.49** | **33.80** | **35.26** | **36.34** | **42.15** | **45.22** | **42.85** | **40.49** | **40.38** | **40.30** | **40.20** | **40.08** | **39.97** | **39.86** | **39.76** | **39.67** | **39.60** | **39.54** | **39.54** | **39.51** | **39.49** | **39.49** | **39.50** | **39.60** |
| 2017 | **21.86** | **26.93** | **28.89** | **30.58** | **31.64** | **32.09** | **33.06** | **34.27** | **35.64** | **36.62** | **42.07** | **43.51** | **40.62** | **40.40** | **40.32** | **40.24** | **40.14** | **40.03** | **39.92** | **39.82** | **39.72** | **39.62** | **39.55** | **39.50** | **39.46** | **39.46** | **39.44** | **39.43** | **39.44** | **39.52** |
| 2018 | **21.98** | **27.02** | **29.25** | **31.04** | **31.86** | **32.41** | **33.42** | **34.48** | **35.81** | **36.71** | **40.33** | **41.28** | **40.53** | **40.31** | **40.21** | **40.13** | **40.02** | **39.91** | **39.82** | **39.72** | **39.61** | **39.54** | **39.52** | **39.46** | **39.38** | **39.34** | **39.30** | **39.29** | **39.30** | **39.36** |

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1997 | 40.00 | 44.21 | 52.89 | 51.81 | 50.22 | 45.89 | 46.98 | 51.58 | 55.25 | 69.28 | 93.28 | 117.91 | 108.05 | 100.15 | **113.48** |
| 1998 | 40.00 | 57.09 | 53.81 | 56.18 | 51.61 | 46.97 | 51.29 | 53.64 | 60.41 | 85.49 | 107.91 | 119.49 | 113.56 | **104.65** | **92.47** |
| 1999 | 40.00 | 43.90 | 57.53 | 47.32 | 48.59 | 48.29 | 51.81 | 61.13 | 83.67 | 88.89 | 115.38 | 117.96 | **98.10** | **94.86** | **80.75** |
| 2000 | 40.00 | 53.31 | 50.23 | 46.40 | 45.43 | 48.08 | 52.46 | 74.62 | 91.97 | 103.38 | 98.47 | **117.39** | **96.02** | **82.02** | **77.44** |
| 2001 | 40.00 | 48.88 | 48.61 | 49.92 | 49.43 | 53.43 | 69.53 | 83.42 | 92.48 | 98.14 | **99.15** | **92.81** | **81.69** | **76.91** | **78.79** |
| 2002 | 33.95 | 53.18 | 49.66 | 50.23 | 51.77 | 74.12 | 87.07 | 94.99 | 94.91 | **88.42** | **88.41** | **80.24** | **75.44** | **77.17** | **79.86** |
| 2003 | 62.17 | 50.47 | 51.21 | 51.86 | 72.28 | 82.38 | 84.91 | 86.83 | **82.24** | **78.04** | **74.55** | **73.48** | **75.49** | **78.35** | **80.00** |
| 2004 | 39.39 | 49.43 | 57.32 | 71.18 | 79.28 | 85.60 | 84.53 | **79.48** | **76.09** | **66.87** | **70.06** | **75.00** | **77.94** | **79.48** | **79.54** |
| 2005 | 57.09 | 48.91 | 66.96 | 79.75 | 78.05 | 76.76 | **72.60** | **67.64** | **56.42** | **53.56** | **61.31** | **69.56** | **70.80** | **70.58** | **70.20** |
| 2006 | 46.51 | 72.19 | 81.77 | 84.01 | 81.03 | **79.33** | **70.85** | **59.76** | **54.14** | **56.90** | **65.58** | **72.15** | **72.12** | **72.14** | **72.21** |
| 2007 | 69.95 | 83.76 | 89.23 | 85.19 | **83.24** | **77.67** | **66.05** | **58.30** | **58.56** | **61.95** | **68.66** | **74.30** | **74.25** | **74.18** | **74.15** |
| 2008 | 82.90 | 80.99 | 83.12 | **83.31** | **78.56** | **66.05** | **57.58** | **56.33** | **58.96** | **62.97** | **69.19** | **75.52** | **75.58** | **75.71** | **75.84** |
| 2009 | 74.73 | 81.48 | **81.16** | **75.72** | **62.19** | **53.23** | **50.69** | **53.56** | **58.21** | **61.63** | **68.74** | **73.83** | **73.97** | **74.08** | **74.05** |
| 2010 | 40.00 | **77.05** | **68.41** | **56.39** | **47.60** | **44.82** | **48.00** | **52.48** | **56.58** | **60.06** | **67.20** | **72.25** | **72.34** | **72.44** | **72.58** |
| 2011 | **68.39** | **60.20** | **50.87** | **43.42** | **40.58** | **41.10** | **43.11** | **46.44** | **50.46** | **53.89** | **60.34** | **66.20** | **66.18** | **66.15** | **66.11** |
| 2012 | **52.64** | **48.41** | **44.37** | **42.71** | **43.29** | **42.95** | **43.85** | **46.78** | **50.70** | **54.13** | **60.80** | **66.41** | **66.44** | **66.52** | **66.65** |
| 2013 | **45.04** | **44.66** | **45.75** | **47.08** | **46.08** | **44.76** | **45.52** | **48.38** | **52.39** | **55.76** | **62.71** | **68.01** | **68.09** | **68.17** | **68.37** |
| 2014 | **43.88** | **48.26** | **52.38** | **51.68** | **49.33** | **47.47** | **47.76** | **50.22** | **54.19** | **57.67** | **64.30** | **69.88** | **69.92** | **69.99** | **68.77** |
| 2015 | **46.86** | **54.19** | **55.64** | **54.33** | **51.70** | **49.34** | **49.20** | **51.81** | **55.83** | **59.28** | **65.94** | **71.43** | **71.48** | **69.98** | **67.78** |
| 2016 | **51.31** | **54.87** | **55.93** | **54.27** | **51.83** | **49.22** | **48.79** | **51.98** | **56.10** | **59.44** | **66.24** | **71.65** | **70.00** | **67.98** | **68.02** |
| 2017 | **51.59** | **55.16** | **56.13** | **54.09** | **51.48** | **48.83** | **48.44** | **51.81** | **55.89** | **59.35** | **66.15** | **69.80** | **67.83** | **67.92** | **67.95** |
| 2018 | **51.38** | **55.06** | **56.18** | **53.84** | **51.05** | **48.58** | **48.39** | **51.85** | **55.87** | **59.27** | **64.47** | **67.78** | **67.79** | **67.79** | **67.83** |

**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 | 40.00 | 38.23 | 38.18 | 46.56 | 45.48 | 46.94 | 43.20 | 46.23 | 53.33 | 54.81 | 75.63 | 91.92 | 40.00 | 40.00 | 40.00 |
| 1993 | 40.00 | 38.65 | 45.03 | 43.67 | 42.48 | 44.29 | 44.11 | 46.26 | 50.64 | 54.17 | 61.36 | 76.90 | 98.86 | 80.81 | 99.93 |
| 1994 | 54.25 | 43.58 | 41.88 | 42.05 | 40.04 | 42.45 | 41.83 | 48.63 | 51.64 | 60.74 | 69.25 | 70.68 | 88.62 | 98.68 | 115.05 |
| 1995 | 47.86 | 40.56 | 37.49 | 30.35 | 38.75 | 40.24 | 40.69 | 44.83 | 55.22 | 45.94 | 40.00 | 86.95 | 40.00 | 40.00 | 133.96 |
| 1996 | 40.00 | 45.55 | 39.73 | 35.43 | 40.98 | 39.26 | 38.29 | 50.52 | 45.93 | 61.31 | 69.51 | 106.12 | 40.00 | 110.55 | 40.00 |
| 1997 | 40.00 | 34.89 | 37.85 | 43.14 | 45.64 | 32.72 | 38.00 | 45.42 | 40.01 | 57.68 | 116.10 | 40.00 | 91.16 | 40.00 | **90.28** |
| 1998 | 40.00 | 27.94 | 37.20 | 37.74 | 36.63 | 43.77 | 36.44 | 53.61 | 48.86 | 90.61 | 105.14 | 119.00 | 103.95 | **92.80** | **87.94** |
| 1999 | 40.00 | 33.57 | 39.64 | 36.99 | 30.03 | 38.19 | 50.62 | 53.83 | 67.51 | 87.43 | 94.98 | 100.44 | **88.77** | **81.70** | **71.32** |
| 2000 | 40.00 | 40.07 | 41.90 | 30.58 | 24.85 | 33.81 | 67.98 | 50.09 | 97.83 | 91.21 | 94.70 | **88.88** | **85.48** | **69.90** | **66.09** |
| 2001 | 40.00 | 48.24 | 36.66 | 37.62 | 39.53 | 44.56 | 59.17 | 86.38 | 92.82 | 88.91 | **80.34** | **82.26** | **72.82** | **68.32** | **70.22** |
| 2002 | 40.00 | 37.45 | 32.81 | 39.01 | 42.24 | 62.68 | 75.75 | 75.21 | 89.50 | **72.03** | **76.68** | **71.18** | **66.80** | **68.76** | **71.62** |
| 2003 | 40.00 | 35.59 | 38.90 | 40.81 | 67.20 | 73.60 | 83.06 | 76.63 | **76.52** | **70.01** | **67.23** | **66.09** | **67.51** | **70.13** | **71.51** |
| 2004 | 27.54 | 35.64 | 39.78 | 55.37 | 67.63 | 71.12 | 73.76 | **67.71** | **66.82** | **58.92** | **62.43** | **66.31** | **69.12** | **70.48** | **70.50** |
| 2005 | 31.93 | 33.03 | 58.11 | 65.34 | 68.98 | 67.30 | **69.90** | **61.28** | **54.91** | **53.07** | **62.21** | **68.43** | **69.60** | **69.37** | **69.03** |
| 2006 | 40.00 | 51.75 | 65.02 | 68.68 | 68.29 | **63.76** | **57.73** | **50.07** | **48.88** | **53.51** | **63.73** | **68.42** | **68.21** | **68.08** | **67.81** |
| 2007 | 40.00 | 46.05 | 68.18 | 64.79 | **67.93** | **64.08** | **52.16** | **47.83** | **51.07** | **55.95** | **62.93** | **68.38** | **68.47** | **68.65** | **68.85** |
| 2008 | 40.00 | 59.36 | 74.08 | **65.53** | **64.28** | **52.34** | **45.80** | **46.58** | **51.32** | **55.55** | **61.92** | **68.04** | **68.16** | **68.52** | **68.75** |
| 2009 | 40.00 | 66.77 | **71.04** | **63.81** | **51.43** | **43.63** | **42.24** | **45.43** | **49.88** | **53.37** | **59.32** | **66.21** | **66.32** | **66.39** | **66.40** |
| 2010 | 77.23 | **67.11** | **60.33** | **50.26** | **43.35** | **41.54** | **43.77** | **47.10** | **50.78** | **54.08** | **63.15** | **65.75** | **65.81** | **65.86** | **65.81** |
| 2011 | **62.71** | **57.63** | **48.45** | **41.51** | **38.85** | **38.98** | **40.65** | **44.15** | **48.11** | **51.41** | **59.72** | **63.00** | **63.00** | **63.00** | **63.12** |
| 2012 | **48.07** | **44.87** | **40.70** | **38.99** | **39.12** | **38.86** | **40.58** | **44.28** | **48.37** | **51.80** | **60.11** | **63.72** | **63.90** | **64.05** | **64.36** |
| 2013 | **38.12** | **38.93** | **39.34** | **40.40** | **40.01** | **39.35** | **41.26** | **44.85** | **48.91** | **52.39** | **60.37** | **64.49** | **64.76** | **65.08** | **65.59** |
| 2014 | **34.65** | **39.48** | **43.52** | **42.41** | **41.44** | **40.67** | **42.10** | **45.18** | **49.27** | **52.88** | **59.40** | **65.39** | **65.65** | **65.95** | **65.16** |
| 2015 | **34.43** | **42.38** | **43.38** | **41.70** | **40.50** | **39.90** | **41.36** | **44.89** | **49.05** | **52.63** | **59.85** | **64.86** | **65.08** | **63.89** | **62.16** |
| 2016 | **38.79** | **42.94** | **43.42** | **41.40** | **40.10** | **39.44** | **40.85** | **44.79** | **49.00** | **52.48** | **60.03** | **64.64** | **63.42** | **61.64** | **62.12** |
| 2017 | **39.13** | **43.28** | **43.58** | **41.44** | **39.92** | **39.24** | **40.71** | **44.75** | **48.97** | **52.53** | **60.06** | **63.08** | **61.38** | **61.72** | **62.18** |
| 2018 | **39.10** | **43.15** | **43.29** | **41.41** | **39.65** | **39.20** | **40.78** | **44.87** | **49.10** | **52.64** | **58.41** | **61.24** | **61.51** | **61.79** | **62.21** |

**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 | 34.30 | 40.39 | 42.83 | 46.57 | 52.13 | 54.94 | 54.32 | 55.79 | 57.53 | 57.30 | 58.74 | 68.76 | 63.08 | 57.99 | 65.63 | 72.82 | 72.57 | 116.16 | 96.32 | 97.71 | **95.37** | **74.89** | **62.62** | **58.09** | **59.79** | **63.01** | **64.32** | **64.32** | **64.29** | **64.20** |
| 1992 | 26.81 | 33.28 | 35.62 | 40.87 | 41.76 | 42.09 | 42.87 | 45.56 | 46.14 | 48.15 | 46.91 | 52.49 | 49.62 | 53.66 | 58.50 | 75.91 | 90.67 | 86.94 | 89.31 | **82.08** | **68.04** | **54.56** | **49.72** | **51.34** | **54.56** | **55.86** | **55.91** | **55.95** | **55.98** | **56.03** |
| 1993 | 27.06 | 35.96 | 37.82 | 40.16 | 39.59 | 40.09 | 43.08 | 44.03 | 46.14 | 40.89 | 46.74 | 51.50 | 55.42 | 60.08 | 78.26 | 86.56 | 88.46 | 87.03 | **79.12** | **67.86** | **54.98** | **50.07** | **51.66** | **54.88** | **56.16** | **56.19** | **56.21** | **56.21** | **56.18** | **56.04** |
| 1994 | 32.59 | 37.10 | 38.18 | 37.59 | 37.76 | 39.35 | 38.62 | 42.40 | 39.94 | 41.22 | 44.92 | 55.56 | 55.54 | 80.66 | 89.66 | 83.70 | 87.83 | **79.94** | **67.38** | **54.53** | **49.86** | **51.57** | **54.85** | **56.14** | **56.18** | **56.23** | **56.27** | **56.31** | **56.35** | **56.42** |
| 1995 | 34.40 | 37.05 | 35.30 | 35.71 | 37.47 | 36.89 | 38.47 | 35.85 | 40.48 | 39.61 | 48.39 | 56.67 | 79.42 | 87.02 | 87.36 | 85.37 | **81.06** | **67.13** | **56.30** | **51.57** | **53.27** | **56.56** | **57.84** | **57.89** | **57.93** | **57.97** | **58.00** | **58.00** | **57.96** | **57.85** |
| 1996 | 37.99 | 31.58 | 32.41 | 34.22 | 34.59 | 37.68 | 33.92 | 37.29 | 38.35 | 41.90 | 54.84 | 74.06 | 85.37 | 86.15 | 84.98 | **81.17** | **67.25** | **55.70** | **51.05** | **52.76** | **56.02** | **57.34** | **57.40** | **57.44** | **57.47** | **57.49** | **57.49** | **57.46** | **57.43** | **57.42** |
| 1997 | 25.84 | 30.52 | 31.19 | 32.40 | 35.89 | 33.21 | 34.57 | 36.98 | 41.65 | 49.22 | 72.08 | 88.02 | 88.92 | 86.89 | **78.23** | **68.62** | **57.32** | **52.49** | **54.17** | **57.44** | **58.77** | **58.83** | **58.89** | **58.94** | **58.97** | **58.98** | **58.96** | **58.92** | **58.86** | **58.75** |
| 1998 | 27.84 | 30.73 | 29.95 | 34.92 | 32.29 | 33.59 | 35.71 | 38.50 | 48.07 | 64.10 | 84.96 | 91.03 | 83.84 | **79.62** | **69.95** | **56.88** | **51.99** | **53.64** | **56.91** | **58.24** | **58.30** | **58.34** | **58.38** | **58.41** | **58.41** | **58.38** | **58.34** | **58.29** | **58.23** | **58.11** |
| 1999 | 40.00 | 29.63 | 32.60 | 30.14 | 31.86 | 31.90 | 38.04 | 44.05 | 59.24 | 79.39 | 82.75 | 85.12 | **82.59** | **71.07** | **56.81** | **50.84** | **52.07** | **55.31** | **56.64** | **56.69** | **56.74** | **56.77** | **56.80** | **56.80** | **56.79** | **56.76** | **56.73** | **56.69** | **56.63** | **55.50** |
| 2000 | 24.98 | 31.87 | 30.85 | 33.68 | 33.54 | 38.08 | 43.20 | 63.51 | 78.64 | 80.82 | 85.64 | **84.44** | **74.46** | **60.32** | **52.59** | **53.46** | **56.59** | **57.90** | **57.95** | **58.00** | **58.04** | **58.08** | **58.10** | **58.10** | **58.10** | **58.09** | **58.08** | **58.06** | **56.90** | **54.22** |
| 2001 | 40.00 | 30.91 | 33.79 | 34.13 | 39.23 | 45.05 | 64.94 | 78.53 | 83.92 | 87.87 | **87.21** | **79.50** | **65.84** | **55.81** | **54.26** | **56.88** | **57.96** | **58.02** | **58.08** | **58.14** | **58.19** | **58.23** | **58.25** | **58.27** | **58.27** | **58.26** | **58.23** | **56.93** | **54.27** | **53.97** |
| 2002 | 19.98 | 33.16 | 33.11 | 37.08 | 44.46 | 62.14 | 77.27 | 81.71 | 84.86 | **81.66** | **79.30** | **71.71** | **59.36** | **56.11** | **56.97** | **57.55** | **57.41** | **57.41** | **57.44** | **57.48** | **57.50** | **57.52** | **57.52** | **57.52** | **57.51** | **57.50** | **56.16** | **53.62** | **53.51** | **53.44** |
| 2003 | 24.26 | 34.39 | 37.96 | 44.58 | 63.54 | 76.32 | 82.59 | 83.20 | **82.86** | **77.59** | **71.27** | **62.72** | **58.76** | **57.98** | **58.18** | **57.73** | **57.70** | **57.70** | **57.71** | **57.73** | **57.74** | **57.75** | **57.75** | **57.74** | **57.73** | **56.36** | **53.87** | **53.78** | **53.74** | **53.73** |
| 2004 | 32.12 | 36.37 | 43.34 | 61.34 | 75.55 | 80.29 | 80.85 | **79.60** | **74.94** | **64.37** | **62.11** | **59.87** | **58.81** | **57.60** | **56.95** | **56.68** | **56.66** | **56.66** | **56.68** | **56.69** | **56.70** | **56.70** | **56.69** | **56.67** | **55.28** | **52.80** | **52.69** | **52.64** | **52.61** | **52.57** |
| 2005 | 35.07 | 39.95 | 58.17 | 69.89 | 73.76 | 73.49 | **73.00** | **69.51** | **60.21** | **54.43** | **58.59** | **59.70** | **56.60** | **53.96** | **52.61** | **51.96** | **51.72** | **51.60** | **51.51** | **51.47** | **51.45** | **51.43** | **51.40** | **50.03** | **47.53** | **47.42** | **47.35** | **47.27** | **47.14** | **46.77** |
| 2006 | 43.46 | 55.91 | 65.55 | 68.81 | 68.81 | **66.86** | **64.50** | **56.28** | **52.66** | **53.47** | **59.89** | **61.79** | **57.46** | **54.60** | **52.64** | **51.66** | **51.12** | **50.75** | **50.53** | **50.43** | **50.38** | **50.36** | **48.96** | **46.51** | **46.42** | **46.38** | **46.35** | **46.31** | **46.28** | **46.23** |
| 2007 | 40.00 | 62.80 | 64.02 | 66.48 | **64.01** | **60.72** | **52.54** | **49.93** | **52.26** | **55.43** | **60.15** | **62.05** | **58.41** | **55.35** | **53.55** | **52.41** | **51.63** | **51.15** | **50.84** | **50.69** | **50.62** | **49.18** | **46.80** | **46.73** | **46.70** | **46.69** | **46.66** | **46.64** | **46.59** | **46.51** |
| 2008 | 62.42 | 59.78 | 61.58 | **61.37** | **57.38** | **48.63** | **46.03** | **49.26** | **53.16** | **54.27** | **55.96** | **59.25** | **56.06** | **53.67** | **52.13** | **51.19** | **50.91** | **50.83** | **50.82** | **50.82** | **49.31** | **47.00** | **46.92** | **46.86** | **46.81** | **46.76** | **46.70** | **46.64** | **46.56** | **46.42** |
| 2009 | 43.15 | 59.85 | **59.15** | **54.53** | **45.70** | **42.41** | **44.70** | **47.78** | **49.12** | **48.49** | **52.52** | **54.44** | **52.15** | **50.73** | **50.26** | **50.24** | **50.26** | **50.28** | **50.27** | **48.67** | **46.42** | **46.27** | **46.16** | **46.06** | **45.95** | **45.83** | **45.73** | **45.61** | **45.47** | **45.26** |
| 2010 | 52.61 | **50.76** | **45.14** | **36.53** | **33.95** | **35.56** | **38.30** | **40.11** | **40.19** | **40.08** | **45.02** | **47.93** | **46.38** | **45.88** | **45.72** | **45.56** | **45.38** | **45.19** | **43.25** | **40.74** | **40.34** | **40.01** | **39.69** | **39.36** | **39.01** | **38.68** | **38.35** | **38.01** | **37.65** | **37.18** |
| 2011 | **37.63** | **39.53** | **33.21** | **30.87** | **32.79** | **34.93** | **36.84** | **37.22** | **37.80** | **39.11** | **44.74** | **46.68** | **46.15** | **46.03** | **45.90** | **45.77** | **45.62** | **43.74** | **41.34** | **41.01** | **40.72** | **40.46** | **40.20** | **39.92** | **39.63** | **39.39** | **39.17** | **38.98** | **38.89** | **39.16** |
| 2012 | **34.26** | **29.71** | **27.86** | **30.62** | **33.17** | **34.30** | **35.04** | **35.78** | **37.24** | **38.58** | **43.82** | **47.58** | **47.51** | **47.52** | **47.55** | **47.57** | **45.92** | **43.81** | **43.72** | **43.64** | **43.58** | **43.53** | **43.47** | **43.38** | **43.33** | **43.29** | **43.28** | **43.24** | **43.22** | **43.19** |
| 2013 | **24.20** | **25.76** | **29.44** | **33.69** | **34.81** | **35.23** | **35.79** | **36.86** | **38.58** | **39.49** | **44.49** | **48.37** | **48.11** | **48.11** | **48.14** | **46.49** | **44.42** | **44.34** | **44.28** | **44.22** | **44.18** | **44.14** | **44.08** | **43.99** | **43.94** | **43.90** | **43.89** | **43.86** | **43.85** | **43.84** |
| 2014 | **23.29** | **28.43** | **34.36** | **36.56** | **37.53** | **38.22** | **39.11** | **40.15** | **41.50** | **42.07** | **46.71** | **50.59** | **49.96** | **49.86** | **48.19** | **46.15** | **46.08** | **46.03** | **45.99** | **45.93** | **45.88** | **45.85** | **45.81** | **45.72** | **45.67** | **45.64** | **45.63** | **45.63** | **45.62** | **45.64** |
| 2015 | **25.21** | **33.80** | **36.65** | **38.23** | **39.40** | **40.15** | **41.03** | **41.94** | **43.18** | **43.78** | **48.44** | **52.11** | **51.39** | **49.62** | **47.58** | **47.51** | **47.47** | **47.44** | **47.40** | **47.34** | **47.29** | **47.26** | **47.22** | **47.13** | **47.09** | **47.07** | **47.06** | **47.06** | **47.05** | **47.06** |
| 2016 | **29.79** | **34.41** | **36.95** | **38.78** | **39.88** | **40.41** | **41.48** | **42.24** | **43.23** | **43.94** | **48.54** | **51.84** | **49.51** | **47.44** | **47.37** | **47.32** | **47.29** | **47.26** | **47.22** | **47.16** | **47.12** | **47.08** | **47.04** | **46.95** | **46.91** | **46.89** | **46.88** | **46.86** | **46.84** | **46.83** |
| 2017 | **29.89** | **34.59** | **36.96** | **39.35** | **40.54** | **40.50** | **41.80** | **42.51** | **43.08** | **43.93** | **48.29** | **49.61** | **47.01** | **46.91** | **46.86** | **46.82** | **46.79** | **46.77** | **46.73** | **46.67** | **46.63** | **46.60** | **46.54** | **46.45** | **46.42** | **46.40** | **46.38** | **46.36** | **46.34** | **46.33** |
| 2018 | **29.88** | **34.65** | **36.96** | **39.52** | **40.90** | **40.65** | **41.96** | **42.43** | **43.28** | **44.01** | **46.52** | **47.51** | **46.83** | **46.72** | **46.68** | **46.64** | **46.63** | **46.60** | **46.56** | **46.51** | **46.47** | **46.44** | **46.38** | **46.30** | **46.27** | **46.23** | **46.21** | **46.19** | **46.17** | **46.17** |

**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 | 21.66 | 28.73 | 31.88 | 32.72 | 34.71 | 37.03 | 37.51 | 40.67 | 34.52 | 38.56 | 49.24 | 61.30 | 60.47 | 40.00 | 99.36 | 84.60 | 84.75 | **81.97** | **59.97** | **51.79** | **46.58** | **48.00** | **51.23** | **52.50** | **52.51** | **52.51** | **52.53** | **52.56** | **52.61** | **52.79** |
| 1995 | 40.00 | 33.67 | 30.42 | 31.31 | 30.38 | 31.99 | 26.19 | 25.81 | 31.55 | 42.14 | 65.33 | 51.21 | 82.21 | 94.94 | 89.82 | 100.01 | **77.57** | **59.79** | **50.08** | **46.86** | **49.15** | **52.69** | **54.06** | **54.12** | **54.14** | **54.15** | **54.14** | **54.10** | **54.02** | **53.77** |
| 1996 | 24.99 | 29.25 | 30.03 | 32.52 | 32.79 | 34.01 | 25.45 | 37.15 | 37.18 | 35.83 | 51.21 | 74.64 | 81.29 | 102.64 | 95.85 | **78.92** | **59.86** | **54.19** | **49.19** | **50.68** | **53.83** | **55.11** | **55.11** | **55.10** | **55.09** | **55.09** | **55.07** | **55.06** | **55.06** | **55.14** |
| 1997 | 21.51 | 28.57 | 29.66 | 31.60 | 33.84 | 27.62 | 31.54 | 35.93 | 33.53 | 42.00 | 45.41 | 82.01 | 94.74 | 91.32 | **95.50** | **67.50** | **56.43** | **51.89** | **53.75** | **57.08** | **58.46** | **58.51** | **58.53** | **58.53** | **58.51** | **58.48** | **58.46** | **58.45** | **58.47** | **58.56** |
| 1998 | 40.00 | 29.36 | 26.81 | 30.24 | 26.94 | 28.08 | 30.20 | 36.27 | 44.30 | 0.00 | 78.24 | 74.84 | 81.79 | **84.49** | **70.29** | **57.79** | **52.11** | **53.54** | **56.75** | **58.05** | **58.07** | **58.07** | **58.08** | **58.07** | **58.07** | **58.06** | **58.04** | **58.03** | **58.04** | **58.09** |
| 1999 | 40.00 | 31.19 | 26.82 | 27.40 | 30.76 | 27.63 | 33.43 | 41.64 | 54.79 | 73.21 | 83.95 | 83.04 | **75.98** | **68.12** | **54.58** | **48.95** | **50.44** | **53.70** | **55.04** | **55.07** | **55.09** | **55.11** | **55.11** | **55.10** | **55.09** | **55.07** | **55.06** | **55.04** | **55.02** | **53.58** |
| 2000 | 40.00 | 33.66 | 27.88 | 29.53 | 29.56 | 32.81 | 38.12 | 55.94 | 69.88 | 67.87 | 77.85 | **82.64** | **71.92** | **58.40** | **52.19** | **53.28** | **56.41** | **57.73** | **57.77** | **57.79** | **57.81** | **57.83** | **57.83** | **57.83** | **57.82** | **57.81** | **57.80** | **57.80** | **56.30** | **54.21** |
| 2001 | 16.02 | 31.89 | 34.38 | 29.66 | 34.09 | 42.47 | 63.85 | 71.40 | 76.42 | 76.02 | **77.58** | **79.10** | **64.18** | **54.31** | **52.82** | **55.21** | **56.62** | **56.74** | **56.81** | **56.85** | **56.87** | **56.88** | **56.88** | **56.87** | **56.85** | **56.81** | **56.76** | **55.06** | **52.84** | **52.42** |
| 2002 | 9.62 | 25.84 | 26.81 | 32.70 | 38.83 | 56.62 | 74.39 | 77.90 | 81.97 | **78.16** | **76.79** | **67.56** | **57.04** | **53.50** | **54.39** | **54.84** | **54.74** | **54.69** | **54.74** | **54.77** | **54.79** | **54.79** | **54.79** | **54.79** | **54.78** | **54.77** | **53.08** | **51.05** | **51.02** | **51.00** |
| 2003 | 21.67 | 27.87 | 32.39 | 37.72 | 57.57 | 72.44 | 77.99 | 77.91 | **77.95** | **70.22** | **66.18** | **58.80** | **55.27** | **54.77** | **54.96** | **54.66** | **54.69** | **54.71** | **54.73** | **54.74** | **54.74** | **54.75** | **54.75** | **54.75** | **54.75** | **53.03** | **51.01** | **50.97** | **50.93** | **50.88** |
| 2004 | 24.09 | 31.22 | 37.84 | 56.44 | 71.00 | 76.87 | 77.04 | **75.74** | **71.90** | **62.07** | **60.13** | **58.11** | **56.96** | **56.12** | **55.48** | **55.28** | **55.27** | **55.28** | **55.30** | **55.31** | **55.31** | **55.31** | **55.30** | **55.30** | **53.55** | **51.56** | **51.52** | **51.48** | **51.44** | **51.36** |
| 2005 | 25.88 | 34.25 | 53.36 | 68.42 | 71.93 | 73.48 | **70.28** | **68.00** | **58.13** | **52.32** | **56.24** | **57.25** | **54.81** | **53.13** | **52.30** | **52.04** | **51.99** | **51.98** | **51.98** | **51.98** | **51.95** | **51.93** | **51.91** | **50.13** | **48.10** | **48.05** | **48.00** | **47.95** | **47.85** | **47.58** |
| 2006 | 40.00 | 53.90 | 64.20 | 66.40 | 69.92 | **65.00** | **63.79** | **55.42** | **51.28** | **51.71** | **59.73** | **59.91** | **56.87** | **55.28** | **53.75** | **53.27** | **52.83** | **52.03** | **51.60** | **51.24** | **50.88** | **50.76** | **49.03** | **47.06** | **46.89** | **46.86** | **46.85** | **46.85** | **46.86** | **46.92** |
| 2007 | 40.00 | 64.20 | 67.80 | 70.37 | **62.89** | **60.00** | **52.07** | **48.92** | **50.21** | **52.34** | **57.18** | **59.45** | **55.80** | **54.27** | **52.08** | **51.40** | **51.05** | **50.74** | **50.69** | **50.62** | **50.65** | **48.84** | **46.85** | **46.85** | **46.84** | **46.84** | **46.83** | **46.82** | **46.79** | **46.72** |
| 2008 | 40.00 | 57.85 | 63.69 | **63.78** | **58.92** | **50.31** | **47.60** | **49.89** | **53.45** | **53.95** | **57.15** | **60.31** | **58.06** | **56.07** | **54.56** | **53.38** | **52.79** | **52.59** | **52.47** | **52.51** | **50.74** | **48.83** | **48.91** | **48.92** | **48.93** | **49.04** | **49.05** | **49.02** | **48.98** | **48.89** |
| 2009 | 35.15 | 58.02 | **55.70** | **51.03** | **42.09** | **40.19** | **43.21** | **47.77** | **50.18** | **51.02** | **52.95** | **57.81** | **55.11** | **53.17** | **51.38** | **50.06** | **49.43** | **49.16** | **49.01** | **47.24** | **45.38** | **45.43** | **45.54** | **45.60** | **45.64** | **45.75** | **45.78** | **45.79** | **45.78** | **45.74** |
| 2010 | 55.97 | **52.90** | **47.16** | **38.91** | **37.43** | **40.30** | **44.70** | **47.34** | **48.52** | **48.91** | **54.91** | **55.23** | **52.99** | **51.13** | **49.89** | **49.13** | **48.78** | **48.64** | **46.80** | **44.96** | **44.98** | **45.02** | **45.10** | **45.15** | **45.19** | **45.24** | **45.25** | **45.23** | **45.15** | **44.89** |
| 2011 | **45.09** | **37.93** | **32.39** | **31.36** | **34.42** | **37.83** | **39.87** | **41.27** | **41.94** | **42.63** | **48.79** | **50.06** | **48.48** | **47.46** | **46.99** | **46.74** | **46.69** | **44.90** | **43.07** | **43.09** | **43.12** | **43.14** | **43.17** | **43.16** | **43.15** | **43.14** | **43.15** | **43.15** | **43.17** | **43.23** |
| 2012 | **30.54** | **28.39** | **28.09** | **31.54** | **35.26** | **36.49** | **37.56** | **38.53** | **39.61** | **40.67** | **47.38** | **48.75** | **47.80** | **47.51** | **47.39** | **47.37** | **45.59** | **43.74** | **43.75** | **43.79** | **43.84** | **43.87** | **43.87** | **43.88** | **43.87** | **43.88** | **43.90** | **43.91** | **43.93** | **43.99** |
| 2013 | **23.08** | **24.68** | **28.04** | **31.87** | **33.61** | **33.93** | **34.86** | **36.27** | **37.65** | **39.17** | **45.64** | **48.36** | **48.09** | **48.02** | **47.99** | **46.26** | **44.42** | **44.45** | **44.50** | **44.57** | **44.61** | **44.64** | **44.66** | **44.71** | **44.73** | **44.75** | **44.77** | **44.78** | **44.80** | **44.84** |
| 2014 | **19.85** | **24.01** | **28.77** | **30.65** | **31.73** | **32.31** | **33.26** | **34.69** | **36.30** | **37.94** | **42.97** | **48.16** | **47.84** | **47.82** | **46.13** | **44.31** | **44.40** | **44.48** | **44.58** | **44.65** | **44.71** | **44.74** | **44.81** | **44.93** | **45.01** | **45.06** | **45.07** | **45.08** | **45.09** | **45.08** |
| 2015 | **19.36** | **27.32** | **29.29** | **30.83** | **32.00** | **32.63** | **33.36** | **34.94** | **36.66** | **37.89** | **43.82** | **47.86** | **47.56** | **45.85** | **44.09** | **44.20** | **44.29** | **44.37** | **44.43** | **44.49** | **44.57** | **44.61** | **44.65** | **44.74** | **44.86** | **44.92** | **44.95** | **44.96** | **44.96** | **44.96** |
| 2016 | **23.47** | **27.85** | **29.76** | **31.36** | **32.58** | **33.07** | **33.85** | **35.17** | **36.73** | **37.94** | **43.92** | **47.43** | **45.46** | **43.71** | **43.82** | **43.91** | **43.98** | **44.05** | **44.12** | **44.19** | **44.25** | **44.27** | **44.31** | **44.40** | **44.51** | **44.55** | **44.59** | **44.60** | **44.60** | **44.61** |
| 2017 | **23.81** | **28.17** | **30.24** | **31.97** | **32.87** | **33.38** | **34.22** | **35.39** | **36.77** | **37.93** | **43.62** | **45.36** | **43.39** | **43.50** | **43.57** | **43.65** | **43.72** | **43.77** | **43.84** | **43.93** | **43.98** | **44.00** | **44.02** | **44.13** | **44.23** | **44.27** | **44.30** | **44.31** | **44.31** | **44.32** |
| 2018 | **23.90** | **28.23** | **30.51** | **32.25** | **32.91** | **33.56** | **34.38** | **35.39** | **36.82** | **37.94** | **41.65** | **43.28** | **43.20** | **43.27** | **43.34** | **43.42** | **43.49** | **43.56** | **43.63** | **43.71** | **43.75** | **43.77** | **43.80** | **43.90** | **43.99** | **44.02** | **44.05** | **44.06** | **44.06** | **44.07** |

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