Actuarial Review of the Federal Housing Administration Mutual Mortgage Insurance Fund (Excluding HECMs) for Fiscal Year 2010

October 12, 2010

Prepared for

U.S. Department of Housing and Urban Development

By

Integrated Financial Engineering, Inc.

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October 12, 2010

The Honorable David H. Stevens
Assistant Secretary for Housing -- Federal Housing Commissioner
451 Seventh Street, SW, Room 9100
Washington, DC 20410

Dear Mr. Stevens:

IFE Group has completed and, along with this letter, is submitting the fiscal year 2010 Actuarial Review of the MMI Fund Excluding HECMs (the Fund).

We estimate that the Fund's economic value as of the end of fiscal year 2010 was $5.16 billion and the unamortized insurance in force was $926.25 billion. We project that at the end of fiscal year 2017 the Fund's economic value will be $39.58 billion and the unamortized insurance in force will be $1,300.23 billion. We also estimate that the economic value could be negative in FY 2010, and stay negative until FY 2013, 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 forecasts by Moody's Analytics and the assumptions concerning 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 Yang, Ph.D.
Chairman and CEO
Integrated Financial Engineering, Inc.

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Federal Housing Administration
Mutual Mortgage Insurance Fund (Excluding HECMs)
for Fiscal Year 2010

I have reviewed the "Actuarial Review of the Federal Housing Administration Mutual Mortgage Insurance Fund (Excluding HECMs) for Fiscal Year 2010," dated October 12, 2010. The purpose of my review was to determine the soundness of the methodology used, the appropriateness of the underlying assumptions applied, and the reasonableness of the resulting estimates derived in the Review

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

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

Phelim Boyle, Ph.D., FIA, FCIA
Fellow of the Institute of Actuaries (UK)
Fellow of the Canadian Institute of Actuaries
October 12 2010

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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) 2010.

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 2010 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,*

to be used by HUD in computing the aggregated economic value and capital ratio of the entire MMI Fund.

Under the base-case assumptions we estimate that the economic value of the Fund as of the end of FY 2010 is $5.16 billion. This represents an increase of 88.9 percent from the $2.73 billion economic value as of the end of FY 2009. This increase is a result of several significant offsetting changes. Because the HECM business is excluded from this analysis, we do not report the capital ratio, but conclude that the capital ratio of the Fund, excluding HECMs, remains below two percent this year.

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 2010 and stay negative until FY 2013.

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 2010 to 2017 ($ 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**
2010	5,160	926,251	879,875	5,698	292,825	
2011	10,969	1,100,922	1,042,981	5,741	282,948	68
2012	14,858	1,235,987	1,165,415	3,580	267,382	309
2013	19,777	1,313,329	1,230,827	4,307	262,813	611
2014	24,243	1,301,850	1,209,729	3,576	230,580	891
2015	29,016	1,281,630	1,181,605	3,655	229,467	1,118
2016	34,033	1,281,264	1,175,122	3,618	243,022	1,399
2017	39,582	1,300,227	1,188,232	3,834	257,706	1,715

[a] All values are as of the end of each fiscal year. The economic value for each future year (FYs 2011 through 2017) 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, 2010, HUD projections of new endorsements, and projected loan performance.
[c] Based on HUD September 2010 projection.

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 2010 is -$17.80 billion, and the economic value

remains negative through 2014, becoming positive in FY 2015, and staying positive thereafter. In two other less severe recessionary scenarios, the economic values of the Fund are negative in FY 2010, but become positive sooner than FY 2013, and stay positive in all future years. Under the two remaining more optimistic alternative scenarios, the economic value of the Fund is positive in FY 2010 and in all future years. Given the high uncertainty regarding future house prices, our sensitivity analysis suggests that there is a 40 percent chance of further large declines in home values that could result in the economic value of the Fund being less than zero.

B. Sources of Change in the Status of the Fund

Change in Economic Value from FY 2009 to FY 2010

We estimate that the economic value of the Fund was $5.16 billion as of the end of FY 2010, which represents an increase of $2.43 billion compared to the economic value of $2.73 billion as of the end of FY 2009 reported in last year's Actuarial Review. This represents an 89 percent increase in the estimated economic value of the Fund over the past year. Meanwhile, there has been a 35 percent increase in the estimated unamortized IIF from $686.26 billion to $926.25 billion.

Current Estimate of FY 2010 Economic Value Compared with the Estimate Presented in the FY 2009 Actuarial Review

Our current estimate of the FY 2010 economic value is $2.72 billion lower than the economic value projected for FY 2010 in the FY 2009 Actuarial Review. Our current estimate of the FY 2016 economic value is $34.03 billion which is $7.04 billion lower than estimated in the FY 2009 Actuarial Review. These differences are attributed to the following changes, with the magnitude of the change in the FY 2010 economic value for each of the changes shown in parentheses:

- using the updated data to estimate origination volume and credit composition of the FY 2009 and FY 2010 books of business and the capital resources as of the end of FY 2010 (+$8.14 billion),

- including the adjustment for a transfer from the Fund to the HECM financing account (-$1.75 billion),

- updating the econometric, status simulation, and loss severity rate models (-$5.28 billion),

- updating the forecasts of future economic conditions and origination volumes and compositions of future books of business (-$4.45 billion),

- updating FHA's new insurance premium schedule (+$0.61 billion).

In total, the economic value of the Fund increased during FY 2010, but is $2.72 billion lower than what was projected in last year's Review.

The projected FY 2016 economic value is $7.04 billion lower than the level forecasted in last year's Review. However, this represents a net effect of several large changes, including an increase of $9.88 billion due to updating the actual volume and composition of the 2009-2010 books and the 2009-2010 cash flows, a decrease of $2.28 billion due to adjusting for a Fund transfer to the HECM account, a decrease of $22.96 billion due to change in the economic forecasts, an increase of $15.93 billion due to improvement in credit quality forecast of future endorsements, an increase of $7.49 billion due to the most recent change in the FHA mortgage insurance premium structure, and a decrease of $15.10 billion due to the enhancement of analytical models. These large changes due to different risk factors 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 2010 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, future FHA insurance demand forecasts by HUD, 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 requires 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 and supplemented with various updates up to July 2010. 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. Moreover, 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 2017 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 rate
- One-year Treasury rate
- 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 were forecasted as functions of macro-economic variables including local unemployment rates, as of July 2010. The actuarial estimates are based on the Moody's base case projection that the declining house price trend will slow down in FY 2010, and start a slow recovery in FY 2011. Then, the average growth rate among all MSAs gradually converges to a 2.8 percent long-term stable annual rate. This long-term growth rate is significantly lower than the 5.4 percent in last year's IHS Global Insight 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 recovery in FY 2010; (2) mild second recession; (3) deeper second recession and (4) complete collapse, depression. 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.. A fifth, volatile interest rate scenario was conducted to investigate the impact of short-term volatility of 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 analysis 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 2010 economic value under the most severe alternative scenario is projected to be -$17.80 billion. Under this scenario the economic value of the Fund is projected to remain negative until FY 2014. In contrast, under the stronger recovery in FY 2010 scenario, the economic value for FY 2010 is estimated to be $8.02 billion, which is $2.86 billion higher than that of the base-case estimate. Based on the percentile probabilities Moody's assigned to the stressful scenarios, we estimate that there is approximately a 40 percent chance that the FY 2010 economic value of the Fund could be less than zero.

Exhibit ES-2

Projected Fund's Economic Value Under Alternative Economic Scenarios ($million)						
Fiscal Year	**Base Case**	**Stronger 2010 Recovery**	**Mild 2nd Recession**	**Deeper 2nd Recession**	**Complete Collapse**	**Volatile Interest Rate**
FY 2010 Economic Value	5,160	8,022	-7,856	-13,881	-17,796	7,017
FY 2017 Economic Value	39,582	42,470	23,931	16,662	9,155	54,522

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 type 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 $18.75 billion in FY 2010 and the capital ratio of the Fund, excluding HECM, would have been above two percent.

Section I: Introduction

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

IFE Group was engaged by the Department of Housing and Urban Development (HUD) to conduct the independent actuarial review to estimate the economic value and IIF of the MMI Fund for FY 2010. One of the programs that moved into the Mutual Mortgage Insurance Fund, Home Equity Conversion Mortgages (HECMs), is analyzed separately by IBM, a separate independent contractor, and is excluded from the FY 2010 Actuarial Review reported here. HUD will combine the results in this Review with the corresponding measures from the HECM program to compute the 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 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, projected future economic conditions from Moody's Economy.com, and projected future mortgage originations.

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 actuarial standard 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.

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 estimates of Fund performance, we have assumed continuation of the current HUD policy that no distributive shares will be paid.

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 of upfront and annual mortgage insurance premium schedules, changes in loan limits, and elimination of seller-financed downpayment assistance. 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 the credit policy to maintain MMI Fund 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 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 of 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 will no longer be eligible for FHA insurance. The maximum loan-to-value ratio for borrowers with credit scores between 500 and 579 will be 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 the first-time homebuyer 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. 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 need for manual underwriting reviews. HUD requires that all loans must be submitted through FHA's TOTAL scorecard.

4. Changes in Mortgage Insurance Premiums

[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.

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 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 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.

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 provides 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)[5] 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 and floor for 2008 were revised to $729,750 and $271,050 respectively. These loan limit increases are effective for mortgages endorsed for FHA insurance on or after March 6, 2008.[6]

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 $417,000. Effective January 1, 2009, the FHA mortgage limit for any given area is to be 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, and a floor of 65 percent of the GSE conforming loan, or $271,050.[7]

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

[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] The GSEs are Fannie Mae, Freddie Mac, and the Federal Home Loan Banks.
[6] Mortgagee Letter 2008-06, March 6, 2008, Temporary Loan Limit Increase for FHA
[7] Mortgagee Letter 2008-36, November 7, 2008, 2009 FHA Maximum Mortgage Limits

2009. [8] 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. FHA's single-family national loan limit ceiling and floor for 2009 were $729,750 and $271,050, respectively.

Under the authority of the recently passed Continuing Resolution, 2010 (CR) as part of the Department of Interior, Environmental, and Related Agencies Appropriations Act, Public Law 111-88, the loan limits authorized by ARRA was extended to the end of 2010 calendar year. [9] 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 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. This 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.[10] The FY 2005 Actuarial Review documented that loans with downpayment assistance, especially from non-profit organizations including those channeling seller contributions, experienced significantly higher-than-average claim rates. The Passage of HERA on July 30, 2008 officially terminated the eligibility of loans with seller-funded downpayment assistance for FHA endorsements. Afterwards, the incidence of such loans diminished quickly in FY 2009 and is virtually non-existent in FY 2010. The elimination of seller-financed downpayment assistance will have a significant effect in reducing losses on future FHA books.

7. Foreclosure Avoidance and Loss Mitigation Program

[8] Mortgagee Letter 2009-07, February 24, 2009 Loan Limit Increases for FHA
[9] Mortgagee Letter 2009-50, November 25, 2009 2010 FHA Maximum Loan Limits
[10] "Mortgage Finance Additional Action Needed to Manage Risks of FHA-Insured Loans with Downpayment Assistance," Government Accountability Office, November 2005.

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 being introduced as a national program in 1994,[11] 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.[12] This has the benefit of reducing the total foreclosure cost 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.[13] This loss mitigation proved o 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 permits FHA lenders to offer families more substantial loan modifications and provides FHA with additional loss mitigation authority to assist FHA mortgagors under the Home Affordable Modification Program (HAMP). The Mortgagee letter 2009-23, effective August 15, 2009, announced an FHA Loss Mitigation option, or FHA-Home Affordable Modification Program (FHA-HAMP). FHA-HAMP provides homeowners in default an opportunity to reduce their mortgage payments to a sustainable level. This program is designed to help FHA borrowers already in default or at "imminent" risk of default with opportunities to reduce payments by loan modification. In particular, lenders and servicers may use a partial claim for arrears and principal write-down of up to 30 percent, including arrearages and legal fees and foreclosure costs related to a canceled foreclosure action.[14] Under this program, the front-end debt-to-income ratio should be no more than 31 percent and the back-end debt-to-income ratio should be no more than 55 percent. The modified loan must be a 30-year, fixed-rate mortgage with interest rates not exceeding the market rate by more than 50 basis points.

Some of these programs are intended to reduce claim rates and are expected to improve the economic value of the Fund. Adequate data are not yet available to assess the programs' effects. Thus, the potential impacts of these programs are not incorporated in this Review.

[11] The regulations for the PFS Program are codified in 24 CFR 203.370.
[12] Mortgagee Letter 2008-43, December 24, 2008, Utilizing the PFS Loss Mitigation Option.
[13] 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.
[14] Mortgagee Letter 2009-23, July 30, 2009, FHA's Home Affordable Modification Los Mitigation Option.

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, then down to 0.26 percent in Aug 2010. Similarly, the ten-year Treasury yield also declined from 3.89 percent in Aug 2008 to 3.59 percent in Aug 2009, then to 2.70 percent in Aug 2010. The average conventional 30-year fixed-rate mortgage commitment rate posted by Freddie Mac also declined from 5.19 percent in Aug 2009 to 4.43 percent in Aug 2010. These realized rates are much lower than those previously forecasted by IHS Global Insight in August 2009 and applied in last year's Review.

Based on the July 2010 economic forecasts by Moody's Analytics, which is used for this year's review, future mortgage rates will steadily rise through the third quarter of 2012 up to 7.26 percent, then stabilize at 6.30 percent afterward. The one-year Treasury rates will steadily rise to 4.15 percent by the fourth quarter of 2012, and the ten-year Treasury rates will rise to 5.75 percent by the first quarter of 2012. The current Moody's forecasted rates during FY 2010 to 2012 are higher than those forecasted by Global Insight back in 2009. However, the longer-run interest rates in Moody's forecasts for 2013 and later are lower than those of Global Insight's 2009 forecasts. As a result, prepayment activity is projected be slower than was forecasted last year for the first couple of years, but then higher in FY 2013 and later.

2. House Price Growth Rates

Projections for future home price growth rates are based on the Moody's Economy.com forecast in July 2010. In past reviews, Global Insight's economic forecasts had been used. Moody's forecasts are used for this year's review primarily to take advantage of their capacity to provide house price index forecasts at the local level, including metropolitan, state, Census region, and national levels. Moody's publishes its forecasting methodology and provides a description of the rationale behind the assumptions. In addition to the base-case forecast, several alternative scenarios were also made available to us corresponding to various probabilities of occurrence.

The realized annual national FHFA house price index growth rate from the second quarter of 2009 to the first quarter of 2010 was negative 4.95 percent, compared to the negative 8.67 percent forecasted by IHS Global Insight made in Aug 2009. The less stressful housing market deterioration has the effect of making the most recent claim rates lower than those projected in last year's Review. However, regarding future years, the house price growth rate forecasts by Moody's in July 2010 are lower than the previous forecasts by IHS Global Insight in last year's Review. IHS Global Insight projected a 1.38 percent increase in FY 2010 while Moody's

forecasts only 0.04 percent for the same period. For the following five years, IHS Global Insight projected an average annual increase of 3.75 percent, while Moody's forecast averages 3.10 percent. Specifically, Moody's forecasts housing price growth rates to accelerate to a peak rate of 5.5 percent by FY 2014, and then converge to a 3.2 percent long-run steady state. Even though the forecasts used in this year's Review predict rising house prices in the future, the growth rates are relatively weak when compared to historical growth rates and to those previously forecasted by IHS Global Insight. For the loans originated in FY 2006 and FY 2007 at the top of the cycle, house prices will not return to the levels when those loans were first originated until FY 2015.

Although housing market conditions during the past year were better than the forecasts used in last year's Review, the overall forecasts used for this year's Review are for weaker future growth rates, so that claim rates will remain high during the next five years. This is especially the case for loans originated at the peak of the housing boom in FY 2006 and FY 2007. During the next two years when the housing market is expected to be stagnant, many of those loans will still be in a negative equity situation, posing a significant risk factor to the Fund. As the geographic profile of FHA's insurance portfolio may deviate from the overall housing finance market, MSA level house price forecasts were applied in this year's Review. The average long-term housing price growth rate among all MSAs of 2.8 percent per annum forecasted by Moody's this year is much lower than the 5.4 percent forecasted by IHS Global Insight last year. This more pessimistic long-term forecast implies future books of business may experience much higher claim rates and larger losses.

3. Mortgage Demand

FHA's market share has increased dramatically since FY 2008. FHA's market share had dropped significantly following FY 2002 as the subprime mortgage market expanded. Since late 2007, the subprime mortgage market contracted, followed by scaling back by all private mortgage insurers. Thus, FHA has become a primary source of financing for all higher LTV borrowers, with a share of almost 20 percent of the whole market during the past two years. The Fund origination volume during FY 2009 reached $330 billion, which was a 560 percent increase from FY 2006, the year with the smallest book in recent years. Importantly, this large increase in volume included a significant portion of high-FICO-score, low-risk borrowers. As lenders and private mortgage insurers reenter the mortgage markets, FHA forecasts that their endorsement volume will fall from the recent historic highs, but will still remain significantly above $200 billion through FY 2017. FHA also expects that the credit quality of the future books of business will conform more closely to historical norms, similar to the credit quality of their books in the mid-1990's prior to the emergence of the subprime markets.

The larger origination volume for new books of business will lead to faster growth in the IIF. Meanwhile, most mortgages will experience their peak claim rates 4 to 7 years after origination.

This indicates that the average conditional claim rate of the whole portfolio may steadily increase over the next few years as these larger books of business move through their peak claim periods.

4. Implications of Recent Problems in the Subprime Mortgage Market

The current financial crisis which started with problems in the U.S. subprime and Alt-A mortgage markets is still unfolding, and the U.S. national economy is still in a difficult situation. Many of the initial problems in the subprime market were attributable to the special characteristics of subprime mortgage contracts, lack of adequate underwriting for subprime mortgages, and a prevalence of higher-risk borrowers with impaired credit and/or unverified income and employment. Many subprime mortgages were securitized and these securities were sold to investors in the U.S. and across the world. As defaults of those loans mounted, many of the securities lost substantial portions of their values, which had a strong negative impact on other financial markets and on credit conditions in general.

Although the financing of subprime loans has been largely discontinued, the fallout continues to be far-reaching with profound consequences for credit markets, mortgage markets and housing finance. The market for conventional mortgages has tightened considerably. Many lenders and mortgage providers have experienced financial difficulties and have scaled back their lending activities. Private mortgage insurers have experienced high claim rates on their subprime and Alt-A exposures, and have had their corporate credit and claim-paying-ability ratings reduced. Fannie Mae and Freddie Mac have both experienced substantial financial losses and are presently under the conservatorship of the Federal government, having received substantial capital injections. Under these conditions, the volume of FHA business has substantially increased and is projected to remain high over the next several years. The FY 2010 volume of new business is projected to be $293 billion, which will be the second largest annual volume in FHA history. At the same time, house prices that had declined significantly are projected to stabilize over the same time span. Recovery is projected after FY 2012.

Although FHA did not participate directly in the subprime or the Alt-A markets, the consequences of the collapse of these markets has had a significant impact on key determinants of FHA's risk exposure. In particular, the overhang of foreclosed properties continues to depress housing market prices. These impacts are incorporated in the assumptions used in this Review, especially in the estimation of the probability of negative equity for individual mortgages.

D. Structure of this Report

We again remind the reader 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 2009 Actuarial Review – presents the Fund's estimated economic value and insurance-in-force for FY 2010 through FY 2017. This section also provides a reconciliation and explanation of the major differences between the FY 2009 and the FY 2010 Reviews concerning the key variables.

Section III. Current Status of the Fund – presents the estimated economic value and IIF for the Fund at the end of FY 2010 and provides an analysis of the performance of the FY 1981 through FY 2010 books of business.

Section IV. Characteristics of the FY 2010 Book of Business – describes the FY 2010 book of business and compares the risk characteristics of the current book to those of previous books.

Section V. Fund Sensitivities – presents sensitivity analyses of the Fund using a range of alternative economic and actuarial 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 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 Rate Analysis – provides a technical description of our econometric model for individual mortgage loss severity rates.

Appendix F. Econometric Results – contains claim and prepayment rates estimated from the econometric model.

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Section II: Summary of Findings and Comparison with FY 2009 Actuarial Review

This section presents the economic value and insurance in force of the Fund[15] for FY 2010 and provides an explanation of how the economic values of this year's Review compare with those of the FY 2009 Review.

A. The FY 2010 Actuarial Review

The FY 2010 Actuarial Review estimated the economic value of the Fund as of the end of FY 2010 (September 30, 2010) and projected the status of the Fund through FY 2017. The objectives of our analysis included:

- 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 2010 and combined with the capital resources to estimate the economic value of the Fund.

The econometric models are similar in most respects to those of the FY 2009 Review, with some major enhancements implemented for the current Review. One major model enhancement implemented this year is the incorporation of historical data on individual loan delinquency of 90 days or more. In addition to tracking claim and prepayment events, the models now also differentiate outstanding loans with respect to their status, either current or in 90-day delinquency status. Another major enhancement is the linking of streamline refinance loans to the original fully-underwritten mortgages issued to the same borrowers. This enables us to more accurately estimate the current LTVs of streamline refinance loans, as well to use additional variables related to the prior fully underwritten mortgages, including credit scores, types of downpayment assistance, and prior mortgage product types.

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

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 2010 (March 2010).

The separate econometric model of loss severity rates was also updated for this year's Review. This model applies the historical loan-level realized loss rates and associates them with the loan characteristics, underlying property location, and macroeconomic conditions.

A third major change was the use of the Moody's Analytics forecasts of the economic factors. For the first time, we were able to use forecasts of local house price appreciation and were able to infer the probabilities of several alternative scenarios.

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

- As of the end of FY 2010, the Fund is projected to have an estimated economic value of **$5.16 billion**, an unamortized insurance-in-force of **$926.25 billion**, and an amortized insurance-in-force of **$879.88 billion**.

- The FY 2010 book of business is projected to contribute an estimated **$5.70 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 33.79 percent per year through FY 2017. With the expected slower prepayment rates of the existing books of business implied by the rising interest rate environment projected through FY 2012, and HUD's projection of high endorsement volume of future books of business, the IIF will increase by an average rate of 4.96 percent per year through FY 2017. The economic value is thus 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 2017. In summary, the economic value is projected to steadily increase over the next 7 years to reach $39.58 billion by the end of FY 2017.

Exhibit II-1

Projected Fund Performance for FY 2010 to FY 2017 ($ 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**
2010	5,160	926,251	879,875	5,698	292,825	
2011	10,969	1,100,922	1,042,981	5,741	282,948	68
2012	14,858	1,235,987	1,165,415	3,580	267,382	309
2013	19,777	1,313,329	1,230,827	4,307	262,813	611
2014	24,243	1,301,850	1,209,729	3,576	230,580	891
2015	29,016	1,281,630	1,181,605	3,655	229,467	1,118
2016	34,033	1,281,264	1,175,122	3,618	243,022	1,399
2017	39,582	1,300,227	1,188,232	3,834	257,706	1,715

[a] All values are as of the end of each fiscal year. The economic value for future years (FY 2011 through FY 2017) 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 June 30, 2010, HUD projections of new endorsements, and projected loan performance.
[c] Based on HUD September 2010 projection.

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 2009 and FY 2010 Reviews. The FY 2009 Review estimated that the Fund had $2.73 billion in economic value at the end of FY 2009 to cover future unexpected claim losses.

We estimate that the Fund has total capital resources of $30.55 billion at the end of FY 2010. The present value of future cash flows is estimated to be *negative* $25.39 billion. Thus, as of the end of FY 2010, the Fund is projected to have $5.16 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 2010 ($ Millions)		
Item	**End of FY 2009[a]**	**End of FY 2010**
Cash	$ 21,123	
Investments	10,252	
Properties and Mortgages	2,291	
Other Assets and Receivables	50	
Total Assets	$ 33,716	
Liabilities	(3,255)	
Total Capital Resources	$ 30,461	
Net Gain from Investments		1,850 [b]
Net Insurance Income in FY 2010		(511)[c]
Net Change in REO Holding		500[b]
Transfer to HECM Account		(1,748)[b]
Total Capital Resources		**$ 30,552**
PV of Future Cash Flows on Outstanding Business		(25,392)
Economic Value	**$ 2,732**[d]	**$ 5,160**
Unamortized Insurance-In-Force	686,263[d]	926,251
Amortized Insurance-In-Force	656,012[d]	879,875

[a] Source: Audited Financial Statements for FY 2009.
[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 2010 provided by FHA and projected net cash flow for the remaining two months
[d] From the FY 2009 Actuarial Review.

As seen in Exhibit II-2, the estimated FY 2010 economic value of the Fund increased by 89 percent from the FY 2009 level reported in last year's Review – from $2.73 billion to $5.16 billion. The IIF also increased by 35 percent – from $686.26 billion to $926.25 billion. The increase in IIF is mainly due to the high endorsement volume in FY 2010. On the other hand, the change in estimated economic value represents the net impact of several significant factors, which will be described in detail below.

C. Sources of Change from the FY 2009 Review to the FY 2010 Review

This section describes the sources of change in estimates between the FY 2009 Review and the FY 2010 Review for the FY 2010 and FY 2016 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 2010 and FY 2016 economic values from those presented in the FY 2009 Review by source of change.

1. Change in Economic Value from FY 2009 to FY 2010

The FY 2009 Review estimated the economic value of the Fund as of the end of FY 2009 to be $2.73 billion, and the projected FY 2016 economic value to be $41.07 billion. In this Review, we estimate the end-of-FY 2010 economic value for the Fund to be $5.16 billion, which represents an increase of $2.43 billion from the FY 2009 economic value reported in the FY 2009 Review. This is an 89 percent increase in the estimated economic value of the Fund. Accompanying this increase in economic value is an increase in the unamortized IIF of 35 percent due primarily to the high endorsement volume in FY 2010.

2. Current Estimate of FY 2010 Economic Value Compared with the Estimate Presented in the FY 2009 Actuarial Review

The FY 2009 Review projected that the FY 2010 investment earnings on Fund balances and the present value of the FY 2010 book of business would add $0.03 billion and $5.12 billion, respectively, to the economic value of the Fund, resulting in a projected FY 2010 economic value of $7.88 billion. As shown in Exhibit II-2, with the updated financial statements and data extract we now observe the end-of-FY 2009 capital resources to be $30.46 billion and estimate the net sources/uses of funds in FY 2010 to be $0.09 billion, yielding the estimated end-of-FY 2010 capital resources to be $30.55 billion. Details on net income in FY 2010 are provided in Section III of this Review. Combining this with the estimated present value of future cash flows of the outstanding portfolio of *negative* $25.39 billion, this year's estimate of FY 2010 economic value is $5.16 billion. Thus, this year's estimate of the FY 2010 economic value is $2.72 billion lower than the economic value of $7.88 billion projected for FY 2010 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 FY 2010 and FY 2016 from the FY 2009 Review as compared to the FY 2010 Review. The net change is primarily driven by four factors: (1) the update to include the actual cash flows and endorsements that occurred prior to the end of FY 2010, (2) the update and enhancement in the econometric models, (3) the change in economic and future endorsement forecasts, and (4) the change in the FHA premium schedule. The forecasted better credit quality of new books of business and the update of the end-of-FY 2010 capital resources improve the projected performance of the Fund in similar magnitude for FY 2010 and FY 2016. Offsetting this is the more pessimistic housing market forecast in FY 2010 by Moody's,

especially in the long run, which implies poorer future performance of the Fund. The overall net changes in economic values of FY 2010 and FY 2016 are both negative but not substantial in size. However, this is a net result of several large offsetting changes. The decomposition analysis below shows that the fund is very sensitive to these risk factors. It will be very important to closely monitor the change in these factors during this volatile economic environment and their implications for the Fund.

Exhibit II-3

Summary of Changes in Fund Estimated Economic Value Between FY 2009 and FY 2010 ($ Millions)				
	Change in FY 2010 Economic Value	FY 2010 Economic Value[a]	Change in FY 2016 Economic Value	Corresponding FY 2016 Economic Value[b]
FY 2009 Economic Value Presented in the FY 2009 Review		$2,732[a]		
FY 2010 Economic Value Presented in the FY 2009 Review, Excluding the FY 2010 Book of Business:	- $26	$2,758		
Plus: Forecasted Economic Value of FY 2010 Book of Business Presented in the FY 2009 Review	$5,124			
Equals: FY 2010 Economic Value Presented in the FY 2009 Actuarial Review		**$7,882**		**$41,068**
Plus: a. Update Volume and Composition of FY 2009-2010 Books	$5,234	$13,116	$6,219	$47,287
Plus: b. Update Actual and Estimated Cash Flows in FY 2009 and FY 2010	$2,910	$16,026	$3,663	$50,950
Plus: c. Adjust for Fund Transfer to HECM Account	-$1,748	$14,278	-$2,282	$48,668
Plus: d. Update Loss Rate Model and include Loss Mitigation Expenses	-$672	$13,606	-$799	$47,869
Plus: e. Enhance Mortgage Termination Econometric Models	-$4,611	$8,995	-$14,302	$33,567
Plus: f. Change to July 2010 Global Insight Economic Forecast	-$2,138	$6,857	-$3,323	$30,244
Plus: g. Change to July 2010 Moody's Local Economic Forecast	-$2,474	$4,383	-$21,899	$8,345
Plus: h. Update to FY2011 OMB Basket of Zero Discount Factors	$165	$4,548	$2,263	$10,608
Plus: i. Update Volume and Composition of FY 2011 and Later Books	$0	$4,548	$15,932	$26,540
Plus: j. Incorporate Premium Changes in April and October 2010	$612	$5,160	$7,493	$34,033
Equals: Estimate of FY 2010 Economic Value	**-$2,722**	**$5,160**	**-$7,035**	**$34,033**

[a] Economic value as the end of FY 2010.
[b] The FY 2016 economic values are the latest year that can be directly compared between the FY 2009 and FY 2010 Reviews.

3. Decomposition of the Differences in Economic Value of the Current Review versus the FY 2009 Review

We now present a step-by-step analysis of the differences in the FY 2009 and FY 2010 Reviews.

a. Update Origination Volume of FY 2009

The first component of change depicted in Exhibit II-3 relates to the updated origination volume and composition for the FY 2009 and FY 2010 books of business. The actual realized origination volume of the FY 2009 book and updated estimate of the FY 2010 book as of September 2010 are very close to what were projected in last year's Review. However, the credit quality of these two books of business in terms of FICO and LTV distribution turned out to be much better than last year's projection.[16] The improved credit quality results in a larger economic value. This change caused an increase of $5.23 billion in the FY 2010 economic value.

b. Update Actual and Estimated Cash Flows in FY 2009 and FY 2010

The second element of change in Exhibit II-3 is the change in the actual and estimated cash flows in FY 2009 and FY 2010. The audited financial statements for FY 2009 indicate that the actual net cash flow of the Fund in FY 2009 is $0.35 billion higher than what was projected in the FY 2009 Review. Although the audited financial statements as of end of FY 2010 were not available when this Review was prepared, information on significant portions of the cash flows during FY 2010 were already available. Combining these partial-year financial data with our cash flow projections for the remaining term of the year, we estimated the net cash flow of the Fund in FY 2010 to be $1.84 billion. The updated actual and estimated net cash flows for FY 2009 and FY 2010 resulted in a $2.91 billion higher FY 2010 economic value.

c. Fund Transfer to HECM Account

In May 2010, an amount of $1.75 billion was transferred from the MMI reserve account into HECM's financing account to cover the increase in expected losses identified by an re-estimation. The amount is now explicitly reserved for HECMs and is no longer available to cover unexpected losses of the non-HECM portfolio. As a result, the FY 2010 economic value is lowered by $1.75 billion.

d. Update Loss Severity Rate Model

A dynamic loss severity rate model that varies with characteristics of claimed loans was

[16] Section IV provides more details.

implemented last year. The model coefficients were re-estimated this year using updated data. The loss rate model now also captures the loss of the Fund due to the expenses associated with loss mitigation cases, which was estimated to be approximately 5.8 percent of the annual loss associated with claim cases. The update of the loss rate model causes the FY 2010 and FY 2016 economic values to decrease by $0.67 billion and $0.80 billion, respectively.

e. Update Mortgage Termination Econometric Models

As a result of our continuing effort to improve the accuracy of the analysis, several major model enhancements were implemented this year. First, the claim and prepayment competing-risk econometric models were expanded to the use the information on the delinquency status among active loans. Second, the characteristics of streamline refinance loans are now more accurately measured by linking them to the original fully underwritten loans. The model enhancements lead to a decrease of economic value in FY 2010 by $4.61 billion, and a decrease in economic value of $14.30 billion in FY 2016.

f. Update Economic Forecast by IHS Global Insight

Compared to its August 2009 forecast, IHS Global Insight's July 2010 forecast is more pessimistic. Specifically, the recent housing recession is extended one more year to last until the end of the 2010 calendar year. Otherwise, the forecasted house price growth rates after 2011 remain similar to those of last year's forecast. However, due to the additional 4 quarters of house price declines, the house price index will remain lower for all future time periods. The more pessimistic short-term housing market forecast by IHS Global Insight caused the FY 2010 economic values to decrease by $2.14 billion and the FY 2016 economic value to decrease by $3.32 billion.

g. Change to Moody's Analytics Economic Forecast

Moody's Analytics forecasts were used for this year's Review primarily to take advantage of ability to provide house price index forecasts at the local level, including metropolitan, state, Census region, and national levels. Moody's publishes its forecasting methodology and provides a comprehensive discussion of the rationale behind the assumptions. In addition to the base-case forecast, we also used several alternative scenarios.

Moody's short-term house price forecasts are similar to IHS Global Insight's forecasts. However, Moody's forecasts housing price growth rates to accelerate to a peak rate of 5.5 percent by FY 2014, and then converge to a 3.5 percent long-run steady state. Even though forecasts used in this review predict rising house prices in the future (beyond the next two years), the growth rates are far weaker when compared to historical growth rates or to the long-term stable rate of 5.4 percent in last year's forecast by IHS Global Insight. This difference in long term

house price growth rate is even more severe at the MSA level forecast, which is used in this Review. Moody's forecast of average long term house price growth rate among all MSAs is only 2.8 percent per annum.

This change in long-term forecast in house price growth rates has the second largest negative impact on the estimated FY 2010 economic value and the largest negative impact on the FY 2016 economic value. The FY 2010 economic value decreased by $2.47 billion and the FY 2016 economic value was lowered by $21.90 billion. This large change in economic value is consistent with the high sensitivity to house price changes that have been observed in previous Reviews and with the sensitivity analyses presented in Section V of this Review.

h. Updated FY 2011 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 2011 discount factors continue to reflect a low interest rate environment, similar to last year. Updating the discounting factors cause the FY 2010 economic value to increase by $0.17 billion. Since the implied forward rates are slightly higher than those used last year, FY 2016 economic value increases by $2.26 billion.

i. Updated Forecast of Future Book Volume and Composition

This component reflects the changes in the economic value for FY 2016 due to changes in HUD's forecasts of the volume and the composition of FY 2011 and later books of business across product types, credit scores, and loan-to-value ratios.

The composition of credit quality in terms of original LTV and borrower credit score continued to improve over the past year. Due to capital limitations and rising credit losses, most private mortgage insurers have tightened their underwriting standards. Without private mortgage insurance, borrowers seeking to make less than 20 percent downpayments are unable to finance through Fannie Mae and Freddie Mac. As a result, whereas FHA previously insured primarily loans at the very highest LTVs, FHA has now become a primary source of housing finance for higher LTV loans. Thus, the average LTV for FHA loans has decreased, producing a lower-risk portfolio overall.

Meanwhile, there has been an significant improvement in FICO score distribution in recent endorsed loans.[17] The most recent policy that set FICO floors further enhances the credit quality of future endorsements. FHA projects that this market condition will continue through FY 2011 and will gradually revert back to more normal conditions similar to the mid-1990's and prior to the emergence of the subprime market. The average credit quality in the mid-1990's was

[17] Moe details are provided in Section IV.

significantly better than that in the 2000's, which was adversely impacted by the aggressive private lending activities. Details of the projected composition of future books of business are described in Appendix C.

The projected improvement in credit quality of FY 2011 and later books has a positive impact on the FY 2016 economic value, an increase of $15.93 billion.

j. Incorporated Premium Changes in April and October 2010

During the last year, 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 to 2.25 percent for all product types.[18] This rule is expected to be replaced by a new schedule for loans endorsed after October 4, 2010, as described below.

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 on the size of the annual mortgage insurance premium that HUD is authorized to charge. FHA subsequently announced[19] 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. Exhibit II-4 summarizes the new premium structure.

Since most of these changes in mortgage insurance premium will not be effective until FY 2011, they have limited impact on the FY 2010 economic value, but will increase the FY 2016 economic value significantly, by $7.49 billion.

[18] Mortgagee Letter 2009-50, November 26, 2009, 2010 FHA Maximum Loan Limits.
[19] Mortgagee Letter 2010-28, September 2010, Changes to FHA Mortgage Insurance Premiums.

Exhibit II-4

FHA Premium Structure: Upfront and Periodic Rates[a] 30-year Fixed-Rate, Purchase and Refinance Loans Effective October 4, 2010 – All Premiums Are in Basis Points			
FICO Credit Scores	LTV Ratios		
	≤ 90%	> 90% & ≤ 95%	> 95% & ≤ 96.5%[b]
≥ 500 & < 580	100/85		
≥ 580	100/85	100/85	100/90

Source: FHA.

[a] Rates are shown here as up-front/annual.

[b] Refinance loans can have LTV ratio up to 97.75 percent.

Section III: Current Status of the Fund[20]

As of the end of FY 2010, the Fund has an estimated economic value of $5.16 billion. The economic value at the end of FY 2009 was $2.73 billion. The current economic value is 89 percent higher than what it was at the end of FY 2009, but is lower than the projected FY 2010 economic value presented in the FY 2009 Review, $7.88 billion. At the same time, the unamortized IIF of the Fund increased 34.97 percent, from $686.26 billion in FY 2009 to $926.25 billion in FY 2010, due to the high endorsement volume of the FY 2010 book of business and the low prepayment rate experienced during FY 2010.

In the remainder of 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 2010 and the projected future performance of new books of business through FY 2017. This section describes the basic components of the Fund's economic value and how they are expected to change through FY 2017.

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 2010, 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 mortgage origination 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 includes the Fund's audited capital resources at the end of FY 2009 at $30.46 billion.

The next step in estimating the capital resources as of the end of FY 2010 is to estimate the sources and uses of funds generated by the Fund portfolio so as to compute the net income over the year. These include the following four factors. (1) Net gain/loss from investment: FHA estimates a net gain of $1.85 billion for FY 2010, including a gain-on-sale of $0.55 billion realized in May 2010. (2) Net insurance income/loss: FY 2010 net insurance income/loss was estimated by combining FHA's reported net cash flow for the period from October 2009 to July 2010 with our model-projected August and September 2010 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 2010 was estimated to be *negative* $0.51 billion. (3) Change in real estate owned (REO) inventory: FHA estimates that its REO inventory will increase by $0.50 billion in FY 2010. (4) A cash transfer to HECM: an amount of $1.75 billion was transferred from the MMI reserve account into HECM's financing account to cover the expected losses identified by the re-estimation in May 2010. The amount is explicitly reserved for HECMs and is no longer available to cover unexpected losses of the non-HECM portfolio. The net adjustment of these four factors is the change in capital resources for the year of $0.09 billion. As a result, the capital resources of the Fund as of the end of FY 2010 were estimated to be $30.55 billion.

Exhibit III-1

Estimates of Fund Economic Value as End of FY 2010 ($ Millions)		
Item	**End of FY 2009[a]**	**End of FY 2010**
Cash	$ 21,123	
Investments	10,252	
Properties and Mortgages	2,291	
Other Assets and Receivables	50	
Total Assets	$ 33,716	
Liabilities	(3,255)	
Total Capital Resources	$ 30,461	
Net Gain from Investments		1,850[b]
Net Insurance Income in FY 2010		(511)[c]
Net Change in REO Holding		500[b]
Transfer to HECM Account		(1,748)[b]
Total Capital Resources		**30,552**
PV of Future Cash Flows on Outstanding Business		(25,392)
Economic Value	**$ 2,732**[d]	**5,160**
Unamortized Insurance-In-Force	686,263[d]	926,251
Amortized Insurance-In-Force	656,012[d]	879,875

[a] Source: Audited Financial Statements for FY 2009.
[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 2010 provided by FHA and projected net cash flow for the remaining two months
[d] From the FY 2009 Actuarial Review.

2. Present Value of Future Cash Flows in FY 2011 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 1981 through the FY 2010 books of business. The present values are computed from the projected cash flows occurring during FY 2011 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 have been realized as of the end of FY 2010. From Exhibit III-2, the total present value of future cash flows is *negative* $25.39 billion. Compared to the corresponding figure estimated in the FY 2009 Review for books through FY 2009, the current liability is reduced by $1.98 billion.

This improvement in economic value is mainly a consequence of having moved beyond the FY 2008 to FY 2010 period, the worst housing recession in Moody's economic forecast. The severe negative house price growth rates during FY 2009 and FY 2010 suggest that in general mortgages originated during the past several years will face high claim rates during the next few years. Together with the high concentration of loans with downpayment assistance from non-profit organizations, the FY 2006 and FY 2007 books are likely to be among the worst books over the past 30 years. Given that their large amount of upfront premiums were already collected and included as part of the current capital resources, the FY 2008 and FY 2009 books will generate large negative cash flows in the future, due to their large origination volume. Exhibit III-2 indicates that if the economy follows the Moody's July 2010 forecast, both the FY 2008 and FY 2009 books will experience the largest negative present values, *negative* $7.75 billion and *negative* $6.65 billion, respectively.

Exhibit III-2

Present Value of Future Cash Flows as of the End of FY 2010 By Origination Fiscal Year & Mortgage Type ($ Millions)							
Fiscal Year	**FRM 30**	**FRM 15**	**ARM**	**SR 30**	**SR 15**	**SR ARM**	**Total**
1981	0						0
1982	0						0
1983	0						0
1984	0						0
1985	0						0
1986	-1		0				-1
1987	-2		0				-2
1988	-2		0				-2
1989	-3		0				-4
1990	-4		0	0			-4
1991	-6		0	0		0	-7
1992	-5		-1	0		0	-6
1993	16		3	-1		0	18
1994	22		4	-2		0	23
1995	8		1	0		0	9
1996	13	0	-2	0	0	0	11
1997	7	0	-5	0	0	0	1
1998	7	0	-5	-4	0	0	-3
1999	-10	-1	-4	-7	0	-1	-23
2000	-97	0	-15	-1	0	-1	-114
2001	-264	-1	-9	-19	0	-2	-296
2002	-481	-3	-57	-51	-1	-15	-606
2003	-956	-6	-75	-285	-5	-31	-1,357
2004	-1,542	-7	-223	-232	-5	-72	-2,081
2005	-748	-17	-261	-140	-4	-48	-1,218
2006	-1,411	-28	-111	-96	-2	-5	-1,654
2007	-2,458	-41	-82	-129	-1	-4	-2,715
2008	-6,813	-128	-250	-515	-7	-40	-7,753
2009	-4,059	-133	-161	-2,096	-20	-178	-6,648
2010[a]	81	-83	-202	-561	-9	-187	-962
Total[b]	-18,709	-449	-1,456	-4,139	-55	-584	-25,392

[a] Based on the volume and composition distribution of the August 2010 HUD forecast.
[b] Number may not add up due to rounding error.

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-4 shows the total volume of new mortgage endorsements for all types of mortgages for each book of business, and the unamortized IIF and the amortized IIF as of the end of FY 2010.

As can be inferred from Exhibit III-3, the FY 2008, FY 2009, and FY 2010 books of business constitute approximately 11.82, 32.36 and 32.34 percent of the Fund's total amortized IIF, respectively. Mortgage endorsements declined significantly after FY 2003 as the subprime market expanded. FHA endorsements, however, have subsequently increased rapidly since FY 2008, as the housing market deteriorated, mortgage default rates skyrocketed, and most private lenders tightened their underwriting standards. Loans endorsed over the past four years are expected to suffer the most from the recent national housing recession. Since over three quarters of the entire Fund is now concentrated in mortgages originated in FY 2008 through FY 2010, the Fund is expected to realize high claim losses during FY 2012 through FY 2015 as these three books of business enter their peak default periods.

The endorsement volume of the FY 2010 book remains high, making it the second largest book in FHA history, slightly smaller than the FY 2009 book. This book has a better-than-usual credit quality composition, and as the housing market is forecasted to slowly move out of its worst period, this book of business is forecast to generate a positive $5.70 billion economic value to the Fund.

Exhibit III-3

Endorsements and Insurance-in-Force of the Fund As of End of FY 2010 (in $ Millions)			
Book of Business[a]	**Mortgage Endorsements**	**Unamortized Insurance in Force[b]**	**Amortized Insurance in Force[b]**
1981	10,266	41	3
1982	7,317	14	3
1983	26,819	112	30
1984	15,931	295	108
1985	24,086	536	232
1986	57,747	1887	826
1987	70,230	2779	1,291
1988	37,433	1370	739
1989	39,764	1280	758
1990	47,127	1314	809
1991	44,067	1,246	804
1992	45,093	1,714	1,117
1993	73,799	3,075	2,037
1994	79,692	4,390	2,995
1995	41,534	1,742	1,278
1996	61,696	3,064	2,247
1997	65,469	3,181	2,450
1998	88,593	5,771	4,480
1999	110,067	8,961	7,096
2000	86,805	4,587	3,885
2001	119,891	8,483	7,260
2002	128,891	14,830	12,716
2003	150,582	42,585	36,695
2004	92,897	34,907	30,924
2005	57,710	31,115	28,333
2006	50,135	28,377	26,547
2007	57,669	32,453	30,951
2008	176,095	107,544	103,998
2009	329,747	291,382	284,711
2010[c]	292,825	287,216	284,551
Total[d]	2,489,978	926,251	879,875

[a] End of year insurance-in-force

[b] Based on June 30, 2010 data extract from HUD and the performance of outstanding loans projected by the econometric model for the fiscal year 2010

[c] Based on the HUD August 2010 projection.

[d] Number 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 2011 to FY 2017 period based on: (a) FHA's forecast of future endorsement volumes and composition, (b) Moody's economic forecasts, and (c) 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 2017) are presented in Exhibit III-4. We observe that these are all positive. Due to the withdrawal of private mortgage lending activities, FHA has become a primary source of housing finance for loans, including those with lower LTVs than has been the case since the early 2000's. With reduced competition from the private market, FHA projects that the credit quality of the FY 2011 through FY 2012 mortgages will continue to be better than the historical average and insurance premiums are scheduled to be higher as well. 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 $ Million)							
Fiscal Year	**FRM 30**	**FRM 15**	**ARM**	**SR 30**	**SR 15**	**SR ARM**	**Total**
2011	5,499	-31	39	300	1	-68	5,741
2012	3,412	-109	31	267	1	-22	3,580
2013	3,942	-72	21	416	3	-1	4,307
2014	3,179	-29	17	403	3	3	3,576
2015	3,252	-28	24	398	3	5	3,655
2016	3,234	-70	20	424	3	6	3,618
2017	3,443	-107	22	466	4	6	3,834

[a.] Present values are estimated as of the end of each corresponding fiscal years.

Section IV: Characteristics of the Fiscal Year 2010 Insurance Portfolio

This section analyzes the characteristics of the loan portfolio insured by the Fund[21] at the end of FY 2010. 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 relative loan size, loan-to-value ratios, and borrower credit scores. This section also examines and compares the FY 2010 book with previous books in order to gain insights into how the FY 2010 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, 2010, the characteristics for the FY 2010 book reflect only loans originated in the first three quarters -- between October 1, 2009 and June 30, 2010. The year-end portfolio size was estimated by HUD.

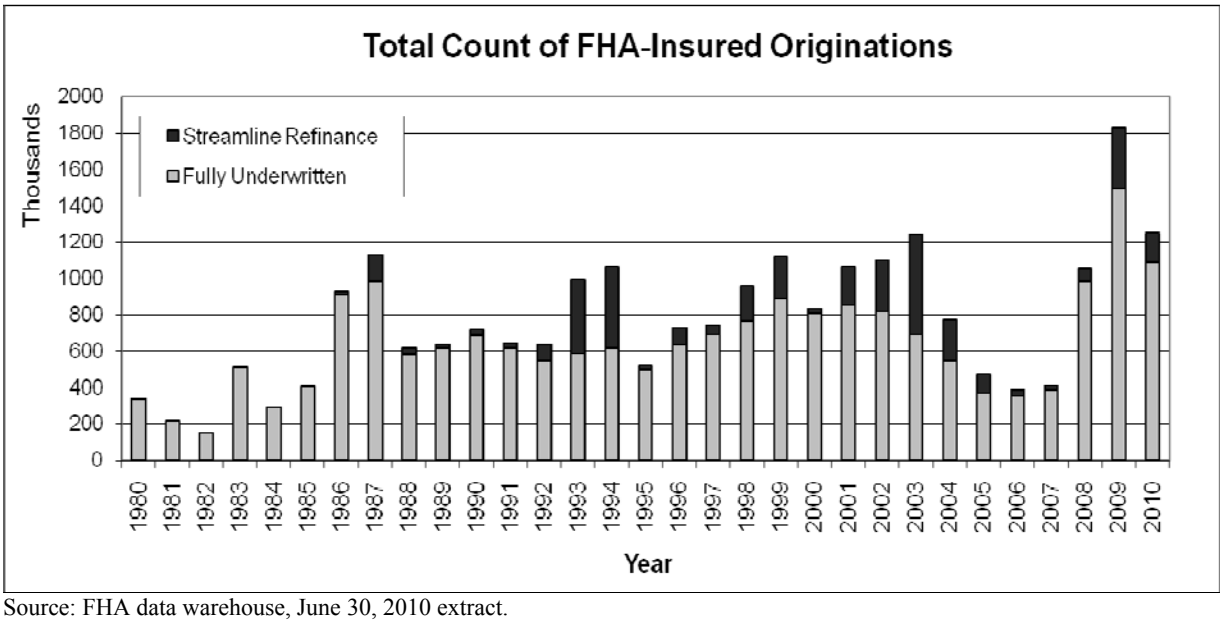
A. Volume and Share of Mortgage Originations

FHA is projected to endorse $292.83 billion[22] in single-family mortgages through the Fund in FY 2010, bringing the Fund's total unamortized IIF to $926.25 billion. Exhibit IV-1 shows the annual FHA origination counts as of June 30, 2010 for fully underwritten purchase and refinance loans and for streamline refinancing loans, for FY 1980 through FY 2010.

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 three years. As private mortgage insurers have tightened their underwriting rules in the aftermath of the subprime mortgage crisis, the market share of FHA has increased dramatically. 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 FY 2008 and FY 2009 as a reaction to the current housing recession and constraints on capital. In the absence of private mortgage insurance, the GSEs were unable 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 two years.

[21] The Fund in this Review refers to MMI Fund excluding HECMs.
[22] According to the September 2010 projection by HUD.

Exhibit IV-1



Source: FHA data warehouse, June 30, 2010 extract.

Exhibit IV-2 shows FHA's origination volume and market share in home purchase mortgages from FY 1994 through FY 2010. 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 been 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 19.94 percent in FY 2010, and its share by dollar volume increased from 1.77 percent in FY 2007 to 14.30 percent in FY 2010.

Exhibit IV-2

FHA's Market Share in the Home Purchase Mortgage Market						
	Number of Mortgages Originated (,000)			Volume of Mortgages Originated (billions, current dollars)		
Fiscal Year	FHA[a]	Market[b]	FHA Share (%)	FHA	Market	FHA Share (%)
1994	652	4,987	13.07	52	696	7.42
1995	556	4,845	11.48	45	689	6.46
1996	686	5,289	12.97	58	784	7.43
1997	751	5,467	13.73	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	6.40	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[c]	511	2,588	19.76	87	567	15.34

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 2010 numbers are through March 31, 2010.

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 2010 Actuarial Review.

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 2006 through FY 2010. The table is based on the top 10 states by dollar volume during FY 2010.

Exhibit IV-3

Percentage of FHA Dollar Volume Originated Between FY 2006 and FY 2010					
State Location[a]	**2006**	**2007**	**2008**	**2009**	**2010**
California	1.52	1.83	7.51	12.80	14.43
Texas	12.56	11.02	7.12	5.51	6.21
Florida	3.91	4.73	4.92	3.87	4.22
New York	3.33	3.40	3.38	3.54	4.08
Virginia	2.78	2.96	3.89	4.28	4.05
New Jersey	3.58	4.37	4.35	4.50	3.95
Illinois	4.08	4.14	4.08	4.08	3.74
Pennsylvania	2.84	3.14	3.28	3.47	3.74
Maryland	2.40	3.10	4.27	4.19	3.62
Georgia	6.12	6.17	4.66	3.47	3.12

Source: FHA data warehouse, June 30, 2010 extract.
[a] States are sorted according to their share of FY 2010 origination volume in the Fund.

The percentage share of FHA loans originated in California increased almost ten-fold from 1.52 percent in FY 2006 to 14.43 percent in FY 2010, 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 1981-2010. 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 2008, in which 30-year FRM endorsements increased from 69.55 percent to 90.78 percent, while 30-year SR

endorsements dropped from 16.30 percent to 5.80 percent. However, the share of 30-year FRMs endorsed in FY 2009 and FY 2010 dropped to 76.79 and 79.22 percent, respectively. The corresponding share of 30-year SRs increased to 19.58 and 13.07 percent, due to the historically low market mortgage rates. The ARM share of the portfolio (including both ARMs and ARM SRs) also shrank dramatically from 8.67 percent in FY 2005 to 0.73 percent in FY 2009, and then rose to 2.53 percent in FY 2010. 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. Meanwhile, 15-year FRMs and 15-year SRs continue to be relatively minor product types in the total Fund portfolio.

The dynamics of the Fund product-type concentrations 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-written Mortgages			Streamline Refinancings		
	30-Year FRMs	15-Year FRMs	ARMs	30-Year SRs	15-Year SRs	ARMs SRs
1981	99.84	0.15	0.00	0.00	0.00	0.00
1982	99.62	0.38	0.00	0.00	0.00	0.00
1983	93.72	6.28	0.00	0.01	0.00	0.00
1984	94.28	5.67	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	4.99	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	66.78	2.51	16.35	10.84	2.17	1.34
1993	45.78	2.24	12.14	29.96	7.75	2.13
1994	42.50	1.80	16.98	27.95	8.05	2.72
1995	65.10	1.28	29.26	2.78	0.93	0.65
1996	61.09	1.29	25.42	8.65	1.72	1.83
1997	57.18	1.10	35.07	3.62	0.69	2.35
1998	65.56	1.15	11.94	17.78	1.39	2.18
1999	73.57	1.13	4.24	18.35	1.74	0.98
2000	85.36	0.71	11.05	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	1.35	2.65	6.66	0.48	0.21
2007	92.14	1.22	1.34	5.12	0.11	0.07
2008	90.78	1.59	1.53	5.80	0.14	0.15
2009	76.79	2.20	0.73	19.58	0.38	0.32
2010[a]	79.22	3.68	2.53	13.07	0.42	1.08

Source: FHA data warehouse, June 30, 2010 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 1981 through FY 2010.

As Exhibit IV-5 indicates, the distribution among initial LTV categories shifted significantly after FY 1999. More than 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, this concentration further reduced to only 4.46 percent.

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 LTV will experience 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.

Exhibit IV-5

Distribution of Originations by Original LTV Category (Percentage of FHA-Insured Mortgages by Dollar Volume)						
Books of Business	Unknown LTV	≤ 80%	> 80% ≤ 90%	> 90% ≤ 95%	> 95% < 97%	≥ 97%
1981	26.92	11.88	26.90	18.44	14.72	1.15
1982	16.40	19.17	26.72	22.53	14.34	0.83
1983	20.37	19.06	24.41	21.53	13.38	1.25
1984	2.77	16.19	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	19.71	35.57	31.87	4.71
1989	8.91	6.78	16.86	33.13	29.89	4.43
1990	11.91	6.14	16.20	32.21	29.13	4.40
1991	1.79	5.59	15.73	29.70	30.07	17.12
1992	1.76	4.38	13.99	28.03	38.26	13.57
1993	0.31	3.64	12.84	25.76	32.72	24.73
1994	0.24	3.46	11.69	24.44	32.78	27.40
1995	0.07	2.74	10.35	24.46	34.32	28.05
1996	0.03	2.83	11.09	25.51	34.72	25.81
1997	0.01	3.25	11.42	26.19	34.67	24.45
1998	0.01	3.55	12.22	26.46	34.86	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	3.26	7.56	6.85	25.33	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	22.66	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[a]	0.01	5.07	15.33	11.48	63.65	4.46

Source: FHA data warehouse, June 30, 2010 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 with 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. In any event, 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.

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 57.09 percent of the FY 2010 loans have FICO scores above 680. Loans with FICO scores below 600 are less than 2 percent of the loans originated in FY 2010, 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. In addition, a stratified sampling design was used to assure adequate representation of FHA loans with and without FICO scores from the pre-2004 period, in order to control for the potential impact of choice-based sampling.

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
1995	3.25	0.02	0.32	0.76	1.46	1.77	3.51	88.90
1996	3.92	0.03	0.71	1.89	3.81	4.51	8.24	76.89
1997	2.37	0.19	1.39	2.56	4.17	3.98	5.60	79.75
1998	1.80	0.24	1.84	3.18	5.23	4.70	5.51	77.50
1999	1.71	0.22	1.83	3.32	5.40	4.66	4.99	77.87
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	4.21	4.57	78.58
2003	1.45	0.32	2.69	4.29	6.18	5.18	5.63	74.27
2004[c]	3.03	0.51	4.94	8.65	12.59	10.44	11.71	48.14
2005[b]	4.92	0.93	9.34	16.96	24.58	20.26	23.00	
2006[b]	4.56	0.92	8.70	16.57	24.41	20.71	24.12	
2007[b]	4.28	1.44	11.68	19.47	24.86	18.84	19.45	
2008[b]	1.99	0.81	7.15	14.81	24.71	22.46	28.08	
2009[b]	0.47	0.05	1.20	5.63	19.43	25.45	47.76	
2010[b]	0.35	0.01	0.20	1.08	14.45	26.80	57.09	

[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.

As the amount of credit score information collected via the standard channel increases, and as the loans with available scores age further, the ability to differentiate loan credit quality by borrower credit history will continue to improve.

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 2009 were provided by HUD. Quarterly median price estimates for all time periods from 1975 to 2010 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 improves on the previous relative loan size variable in two ways: (1) it enables the model to account for the impact of changes in FHA loan limits on the distribution of FHA property values; and (2) it provides a broader-based approach by applying a market-wide estimate of median property values, rather than an FHA-specific estimate of median loan size. This improves the ability of the models to account for the position of FHA loans within the broader market, which may be 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, the original house price is not always available, so we continue to use the relative loan size variable for these products, along with additional variables specific to streamlined products.

Exhibit IV-7 shows the percentage of new 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 steady increase in the relative proportion in the highest house price category. During FY 2009 and FY 2010, the proportion in the lowest house price category also rose substantially.

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 houses in the marketplace, which have been the larger houses having FHA-insured mortgages, incur claims at a lower rate than smaller houses. Since the average quality housing market is relatively more liquid and there are a relatively large number of these similar-quality homes in the area, 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.

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**
1981	7.63	25.02	32.24	20.42	8.76	5.92
1982	10.49	24.33	27.27	20.17	10.03	7.72
1983	5.47	20.65	28.72	23.03	12.17	9.96
1984	8.44	24.53	29.11	20.84	10.08	6.99
1985	6.61	22.90	27.97	21.69	12.12	8.70
1986	4.26	19.36	29.02	24.38	13.62	9.35
1987	4.69	21.15	31.05	23.90	12.12	7.10
1988	6.63	25.74	33.21	21.66	8.96	3.80
1989	6.10	25.00	33.66	22.02	9.37	3.87
1990	5.19	23.04	33.54	23.50	10.55	4.18
1991	5.78	25.50	34.70	22.55	8.61	2.86
1992	5.99	27.36	36.53	21.52	6.77	1.83
1993	5.97	28.47	37.65	20.78	5.84	1.30
1994	6.59	30.10	37.36	19.53	5.30	1.11
1995	8.81	33.39	36.05	17.04	3.83	0.88
1996	8.12	32.20	36.54	17.97	4.09	1.08
1997	8.58	32.93	36.80	16.97	3.69	1.04
1998	7.69	32.46	37.99	17.08	3.68	1.10
1999	6.72	30.28	37.83	18.24	5.25	1.67
2000	7.03	30.29	37.09	17.83	5.79	1.97
2001	8.38	32.35	35.86	16.12	5.32	1.96
2002	9.59	33.56	33.61	15.83	5.44	1.97
2003	8.95	32.99	33.33	16.57	5.78	2.38
2004	8.78	32.39	33.20	16.88	5.93	2.81
2005	7.31	29.67	34.02	18.32	6.88	3.80
2006	6.10	26.24	34.20	19.71	8.23	5.53
2007	5.94	25.60	33.90	19.88	8.58	6.09
2008	6.29	25.34	32.16	19.09	8.93	8.19
2009	11.14	27.22	27.41	16.28	8.61	9.35
2010[a]	12.62	28.70	26.32	15.19	8.01	9.17

Source: FHA data warehouse, June 30, 2010 extract

[a] Based on partial year data.

G. Initial Loan Size Distributions

In addition to the relative house price categories, the relative loan size categories used in previous years are still used in the modeling of streamline refinance loans. For most streamline refinance loans, there is no reliable indicator of the market value of the collateral property, so the relative loan size variable is still used in modeling the performance of these loans. The streamlined refinance loans are typically endorsed without a required appraisal from which an estimate of property value at loan origination can be derived. For streamline refinance loans we include other variables specific to these products, including whether an appraisal was required.

Exhibit IV-8 shows the percentage of new originations within each relative loan size category. Similar to the relative house price distribution, since FY 2008 there has been a trend of increasing concentration in both the largest and the smallest relative loan size. Most of this increase is associated with a decrease in the share of loans in the 100-140 percent relative loan size categories.

Exhibit IV-8

Distribution of Originations by Relative Loan Size Category (Percentage of FHA-Insured Mortgages by Dollar Volume)						
Book of Business	**0-60% of Average Loan Size**	**60-80% of Average Loan Size**	**80-100% of Average Loan Size**	**100-120% of Average Loan Size**	**120-140% of Average Loan Size**	**>140% of Average Loan Size**
1981	4.07	11.04	23.46	29.62	19.49	12.32
1982	4.89	11.31	21.39	27.75	20.78	13.87
1983	4.16	11.48	22.36	28.25	22.22	11.52
1984	4.30	11.71	22.27	28.22	21.29	12.22
1985	4.27	11.62	21.91	28.39	23.75	10.06
1986	3.60	11.48	23.01	30.17	23.98	7.76
1987	3.51	11.78	23.15	29.51	23.88	8.16
1988	4.23	12.17	21.71	28.59	21.36	11.94
1989	4.51	12.37	21.40	26.24	21.28	14.20
1990	4.79	12.63	21.42	25.59	18.93	16.63
1991	4.80	12.55	21.40	24.32	21.40	15.53
1992	4.43	12.35	21.97	25.62	21.60	14.03
1993	3.92	12.31	23.16	26.89	20.90	12.82
1994	4.33	12.81	22.34	24.93	20.31	15.27
1995	4.74	12.99	20.93	24.60	20.83	15.91
1996	4.56	12.87	21.01	25.28	21.54	14.74
1997	4.63	12.92	20.49	25.78	21.68	14.50
1998	4.29	12.53	21.14	27.72	21.53	12.79
1999	4.63	12.94	21.45	25.82	19.08	16.08
2000	5.28	12.82	20.80	24.00	18.92	18.19
2001	4.93	12.32	22.01	24.85	19.11	16.78
2002	5.14	12.29	21.72	24.51	18.88	17.46
2003	5.08	12.22	21.80	25.09	18.86	16.96
2004	5.89	12.46	20.10	22.97	18.77	19.80
2005	5.88	12.77	19.57	22.75	18.85	20.18
2006	5.91	13.17	19.29	22.62	18.22	20.79
2007	5.96	13.05	19.47	22.65	17.94	20.93
2008	6.37	13.34	20.31	21.02	16.09	22.86
2009	7.39	13.46	19.15	18.51	14.59	26.90
2010[a]	8.09	13.65	18.43	17.40	13.48	28.95

[a] Based on partial year data.

H. Initial Contract Interest Rate

Exhibit IV-9 shows the average contract rate by mortgage type since FY 1993. In general, average contract rates in FY 2010 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 earlier FY 2009 through FY 2010 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 claim losses.

Exhibit IV-9

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**
1993	7.76	7.41	5.87	8.16	7.59	6.28	7.64
1994	7.57	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[a]	5.20	4.66	4.07	5.21	4.68	4.32	5.14

Source: FHA data warehouse, June 30, 2010 extract.
[a] Based on partial year data.

I. Source of Downpayment Assistance

Exhibit IV-10 reports the distribution of annual loan endorsements by source of downpayment assistance since FY 2000. 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 in FY 2009 and FY 2010.

Exhibit IV-10

Concentration of Loans with Downpayment Assistance by Source (Percent)[a]					
Origination Year	**No Gift**	**Relative**	**Non-profit, Religious, or Community**	**Government**	**Employer**
2000	77.18	18.81	1.83	2.10	0.09
2001	83.23	11.08	4.26	1.36	0.07
2002	82.26	9.15	7.06	1.48	0.06
2003	81.35	7.41	9.76	1.42	0.06
2004	70.23	9.59	18.06	2.04	0.08
2005	63.87	9.50	23.53	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[b]	82.20	16.86	0.12	0.73	0.08

Source: FHA data warehouse, June 30, 2010 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-11 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-11

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**
2001	5.68	7.38	17.56	15.15	8.39
2002	4.77	5.68	15.40	12.96	6.87
2003	4.01	5.48	15.04	12.35	7.86
2004	4.68	5.67	14.97	9.99	7.73
2005	5.56	6.33	15.00	10.27	7.77
2006	5.92	6.42	13.49	8.33	11.32
2007	4.85	4.71	10.20	6.67	6.80
2008	1.97	1.40	3.36	2.48	1.50
2009	0.21	0.13	1.03	0.35	0.24

Source: FHA data warehouse, June 30, 2010 extract.

Among the different downpayment assistance sources, loans with gifts from non-profit organization have the highest cumulative claim rates for all origination years. GAO reported[23] 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-12, which reports the present value of future cash flows by downpayment assistance sources. While loans funded with assistance from non-profit organizations account for about 19.5 percent of the origination volume of FY 2004 through FY 2008 downpayment-assisted loans, they generate 38.3 percent of the negative present value of future cash flows for these loans. The Passage of HERA on July 30, 2008 officially terminated the eligibility of loans with seller-funded downpayment assistance for FHA endorsements. Afterward, the incidence of such loans diminished quickly in FY 2009 and is virtually non-existence in FY 2010.

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

Exhibit IV-12

Present Value of All Expected Future Cash Flows as of the End of FY 2010 By Downpayment Assistance Source ($ Millions)[a]						
Origination Year	**No Gift**	**Relative**	**Non-Profit, Religious, or Community**	**Government**	**Employer**	**Total**
Pre-2000	18	-3	-1	-2	0	12
2000	-78	-23	-9	-4	0	-114
2001	-206	-37	-45	-9	0	-296
2002	-427	-52	-107	-21	0	-606
2003	-847	-109	-367	-36	0	-1,357
2004	-1,072	-186	-760	-62	0	-2,081
2005	-508	-122	-555	-32	0	-1,218
2006	-778	-134	-691	-50	0	-1,654
2007	-1,357	-190	-1,074	-94	0	-2,715
2008	-4,243	-531	-2,825	-154	0	-7,753
2009	-5,147	-905	-524	-71	0	-6,648
2010	-412	-514		-36	0	-962
Total	-15,057	-2,806	-6,958	-571	-1	-25,392

[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-12 shows that these loans would contribute *negative* $6.96 billion to the present value of future cash flows. If we include all cash flows since their endorsements and into future, these loans would have contributed *negative* $13.57 billion to the economic value of the Fund. We also estimated that these loans accounted for $61.47 billion of the IIF as of the end of FY 2010. Therefore, if these loans had been excluded from the Fund, the revised economic value and the unamortized IIF of the Fund would be $18.73 billion and $864.78 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 were still being underwritten in significant amounts.

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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 2010 Actuarial Review of the Fund.[24] 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 worse economic outcomes and the impacts on the Fund performance. The five scenarios are:

- Stronger Recovery in 2010
- Mild Second Recession
- Deeper Second Recession
- Complete Collapse, Depression
- Volatile Interest Rates

The first four scenarios, both more and less favorable, are drawn from alternative economic forecast scenarios published by Moody's Analytics in July 2010, with some modifications. 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 the corresponding HPA paths associated with the first four alternative scenarios below.

Note that after our modification, these scenarios eventually diverge from the base case. That is, the stronger recovery 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 volatile interest rates. This fifth scenario takes the base-case scenario and substitutes selected volatile interest rate paths.

We used the July 2010 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

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

Census region 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 $5.16 billion, and the projected economic value for FY 2017 is $39.58 billion. The economic values and IIFs of the Fund for FY 2010 through FY 2017 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**
2010	5,160	926,251	879,875	5,698	292,825	
2011	10,969	1,100,922	1,042,981	5,741	282,948	68
2012	14,858	1,235,987	1,165,415	3,580	267,382	309
2013	19,777	1,313,329	1,230,827	4,307	262,813	611
2014	24,243	1,301,850	1,209,729	3,576	230,580	891
2015	29,016	1,281,630	1,181,605	3,655	229,467	1,118
2016	34,033	1,281,264	1,175,122	3,618	243,022	1,399
2017	39,582	1,300,227	1,188,232	3,834	257,706	1,715

A. Stronger Recovery in 2010

This scenario assumes a stronger economic recovery in the later part of 2010. Under this scenario the HPA rate reverts back to that of the base-case scenario after the first quarter of 2012. Exhibit V-2 indicates that, compared to the base-case scenario, the FY 2010 economic value of the Fund would increase by $2.86 billion from its base-case value, and the unamortized IIF for FY 2010 would increase by $0.78 billion. This positive impact relative to the base case persists through FY 2017 and would increase the FY 2017 economic value by $2.89 billion. According to Moody's, the probability of an outcome more favorable than this scenario is approximately 10 percent. Equivalently, the probability of an outcome less favorable than this scenario is about ninety percent.

Exhibit V-2

Projected Fund Performance with Stronger Recovery in 2010 ($ 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**
2010	8,022	927,031	880,660	5,991	292,825	
2011	12,662	1,107,639	1,049,527	4,533	282,948	106
2012	16,845	1,244,344	1,173,499	3,825	267,382	357
2013	21,884	1,306,002	1,223,931	4,347	262,813	692
2014	26,486	1,275,033	1,184,846	3,616	230,580	986
2015	31,415	1,241,638	1,145,059	3,707	229,467	1,222
2016	36,647	1,231,917	1,130,812	3,718	243,022	1,515
2017	42,470	1,244,075	1,138,744	3,976	257,706	1,847

B. Mild Second Recession

For this scenario, Moody's assumes that "[a]lthough additional financial policy initiatives such as foreclosure mitigation are put in place and access to credit improves moderately, the improvement is too gradual to allow a substantial rebound in the housing market until 2012." Moody's estimates that there is an approximate 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 2010 decreases by $13.02 billion from the base-case projection to *negative* $7.86 billion. The economic value becomes positive at $2.28 billion by the end of FY 2012 and continues to increase to $23.93 billion by the end of FY 2017.

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**
2010	-7,856	925,633	879,221	3,299	292,825	
2011	-2,364	1,094,703	1,036,910	5,596	282,948	-104
2012	2,279	1,231,482	1,160,769	4,709	267,382	-67
2013	6,641	1,325,551	1,242,495	4,269	262,813	94
2014	10,512	1,357,350	1,262,396	3,572	230,580	299
2015	14,667	1,367,128	1,261,519	3,669	229,467	485
2016	19,034	1,383,593	1,269,244	3,660	243,022	707
2017	23,931	1,409,961	1,287,439	3,938	257,706	959

C. Deeper Second Recession

Under this deeper second recession scenario, Moody's assumes that "as a result of restricted access to credit and continuing high unemployment, the moderate rebound in housing construction which occurred over the first half of 2009 not only pauses but reverses course… No significant recovery begins until mid-2012." Moody's estimates that there is a 90 percent probability that the economy will perform better than this deeper recession scenario.

Exhibit V-4 displays the results based on this scenario. As with the mild second recession scenario, the economic value of the Fund drops below zero under this deeper second recession scenario, and returns to a positive level later in FY 2013 instead of in FY 2012. The FY 2010 economic value falls by $19.04 billion from the base case to *negative* $13.88 billion. Under this scenario, the FY 2017 economic value would be $22.92 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**
2010	-13,881	923,626	877,249	2,180	292,825	
2011	-8,707	1,085,393	1,027,944	5,358	282,948	-184
2012	-3,757	1,221,107	1,150,765	5,196	267,382	-246
2013	675	1,300,289	1,218,486	4,586	262,813	-154
2014	4,226	1,325,741	1,232,825	3,520	230,580	30
2015	8,071	1,358,213	1,253,627	3,650	229,467	195
2016	12,111	1,394,148	1,279,448	3,651	243,022	389
2017	16,662	1,434,235	1,309,906	3,941	257,706	610

D. Complete Collapse, Depression

Under this complete collapse scenario, "foreclosure mitigation policies are unproductive. … House prices resume their decline, and the NAR (National Association of Realtors) median existing sale price ultimately falls cumulatively by 45 percent from its 2005 peak to the third quarter of 2012." This scenario has the most pessimistic projection of the future housing market. The FHFA house price index will continue to decline through FY 2013 with a 33 percent peak-to-trough decrease from its highest level in 2007. Broadly speaking, Moody's estimates that there is a 96 percent probability that the economy will perform better than this depression scenario.

Not surprisingly, this pessimistic depression scenario produces the lowest economic value for FY 2010 among the sensitivity analyses conducted in this Review. Exhibit V-5 shows that the economic value for FY 2010 decreases to *negative* $17.80 billion. The economic value will remain negative and does not become positive until the end of FY 2015. Under this depression scenario, the FY 2017 economic value decreases by 76.87 percent from that of the base-case scenario, to $9.16 billion.

Exhibit V-5

Projected Fund Performance with Complete Collapse, Depression 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**
2010	-17,796	924,019	877,620	1,318	292,825	
2011	-13,621	1,086,537	1,029,003	4,411	282,948	-236
2012	-9,615	1,222,778	1,152,286	4,390	267,382	-384
2013	-5,533	1,303,889	1,221,777	4,477	262,813	-395
2014	-2,248	1,314,127	1,221,670	3,534	230,580	-249
2015	1,272	1,339,362	1,235,691	3,624	229,467	-104
2016	4,970	1,382,780	1,268,701	3,637	243,022	61
2017	9,155	1,427,771	1,303,788	3,934	257,706	250

E. Volatile Interest Rate Path

In all four of the Moody's economic forecast scenarios discussed thus far, the future paths of interest rates all follow smooth curves. But in the real economy, we observe that the interest rate can be volatile in the short term and may reveal cyclical patterns over time. Hence, for the fifth scenario we selected a volatile interest rate path consistent with the base-case scenario (see Appendix D). This volatile interest rate path is constructed to better understand the impact of interest rate volatility on the performance of the Fund. The primary impact of volatile interest rates is on prepayments, but with potential implications for claim and loss rates: if a greater percentage of a potentially high-loss book prepays, total claim losses are thereby lowered. Although the remaining portion of the book may have an even higher loss rate, it is for a reduced share of the original book of business.

Exhibit V-6 indicates that under this volatile interest rate path scenario the economic value of the FY 2010 Fund would increase by $1.86 billion over its base-case value to $7.02 billion. The FY 2017 economic value would increase from $39.58 billion in the base case to $54.52 billion.

Exhibit V-6

Projected Fund Performance for the Volatile Interest Rate Path 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**
2010	7,017	922,614	876,292	6,343	292,825	
2011	15,620	1,079,728	1,022,647	8,510	282,948	93
2012	22,610	1,210,785	1,141,313	6,550	267,382	440
2013	28,631	1,302,717	1,221,386	5,092	262,813	929
2014	34,256	1,341,554	1,248,672	4,334	230,580	1,290
2015	40,488	1,362,426	1,258,812	4,653	229,467	1,580
2016	47,215	1,384,776	1,272,423	4,774	243,022	1,952
2017	54,522	1,397,833	1,278,416	4,928	257,706	2,379

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 recovery in 2010; (3) mild second recession; (4) deeper second recession; (5) complete collapse, depression; and (6) volatile interest rate path.

Under the base-case forecast, which corresponds to the expected or average scenario, the estimated economic value of the Fund for FY 2010 is $5.16 billion. In the mild second recession scenario, which corresponds to the 75th percentile stress scenario according to Moody's estimate, the estimated economic value is *negative* $7.86 billion. By interpolating between these two results, there is an approximately 60 percent probability that the economic value of the Fund is positive as of the end of FY 2010 based on Moody's assigned probabilities and our modeling assumptions. But because the sensitivity analysis scenarios presented in the Review are more stressful than those of Moody's forecast, because of our modification of their scenarios in the out years as noted above and described in Appendix D, the probability of the Fund to have non-negative economic value is inferred to be higher than 60 percent.

The complete collapse, depression scenario is the most severe economic forecast scenario considered, 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 2010 would be *negative* $17.80 billion. Under three of the six scenarios, the Fund would not remain financially self-sustaining for all future years. Under the depression scenario, the economic value would remain negative through FY 2014. 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 significantly 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 2010 Recovery**	**Mild 2nd Recession**	**Deeper 2nd Recession**	**Complete Collapse**	**Volatile Interest Rate**
2010	5,160	8,022	-7,856	-13,881	-17,796	7,017
2011	10,969	12,662	-2,364	-8,707	-13,621	15,620
2012	14,858	16,845	2,279	-3,757	-9,615	22,610
2013	19,777	21,884	6,641	675	-5,533	28,631
2014	24,243	26,486	10,512	4,226	-2,248	34,256
2015	29,016	31,415	14,667	8,071	1,272	40,488
2016	34,033	36,647	19,034	12,111	4,970	47,215
2017	39,582	42,470	23,931	16,662	9,155	54,522

Section VI: Summary of Methodology

This section provides an overview of the analytical approach used in this Review. Appendix A provides additional details of the statistical 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.

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 loans in the insurance portfolio as of the end of FY 2010, 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.

Prior year Reviews have applied a competing risk framework 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 and claim terminations.

The models implemented for this Review extend beyond the prepay-claim competing framework that was used in previous Reviews. In particular, the surviving mortgages, *i.e.*, not previously prepaid or claimed, are further distinguished into current and default (meaning herein 90-days or more delinquent) status. 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, result in a claim, or

remain current into the next quarter. These four 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 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 Review.

Following an approach suggested by Begg and Gray (1984), we estimated separate binomial logit models for transitions from current-to-default or from default-to-current (cure), and for prepayment or claim terminations from either default or current 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 a 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 claim, or terminate as 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 would automatically be 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.

A change this year is that statistical analysis and forecasting are now undertaken at the loan-level. In prior years, we applied an approach based on highly detailed synthetic loan pools achieved through the use of categorical explanatory variables and discrete indexing of mortgage age – in effect classifying the loan-level data into common "strata" – and then applying sampling weights to account for differences in the number of loans in each stratum. As a result of the increase in number of detailed categorical variables and the additional complexity of the default status transition models, there is little storage memory and computation time advantage to pooling data relative to using loan level data.

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 expanded the approach for this year's Review to include separate piece-wise linear spline functions for the duration of ongoing default episodes. Transitions from current status to default, or claim or prepayment termination, are still modeled as age-dependent probabilities, whereas transitions from default status are modeled as age- and duration-dependent events, so that both the models include both age and duration spline functions.

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 six types of status transition events that need to be predicted and hence estimated: current to default, current to claim, current to prepay, default to cure, default to claim and default to prepay. 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. 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/survive, 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 2010 if the loan had not terminated prior to that date. See Appendix A for the details of classifying quarters according to their default status.

Additional "future" observations were created for projecting the future performance of loans currently outstanding, and additional future cohorts were created to enable simulation of the performance of future books of business. These aspects of data creation and simulation of future loan performance are discussed in greater detail in Appendix C.

C. Statistical Sample

The entire population of loan-level data from the FHA single-family data warehouse was extracted for the FY 2010 analysis. This produced a starting population of approximately 25 million single-family loans originated between FY 1975 through the second quarter of FY 2010. Among these loans, historical status transition records during FY 1990 and later years were reconstructed to estimate the loan status transition models, due to the limited availability of new 90-day default episode data. These data were used to generate loan-level transition event histories for up to 120 quarters (30 years) of loan life per loan, or 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 6 transition probabilities to estimate for 6 loan product types, for total 36 total equations; compared to 2 transition probabilities for 6 loan product types, or 12 total equations as estimated in last year's Review.

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	100 percent
Product 5	FRM15_SR	50 percent
Product 6	ARM_SR	50 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 computation model includes the calculation of four 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 2010.

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 cash flow data from FY 1999 through FY 2009. Details of the loss severity rate model are provided in Appendix E.

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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 claims and prepayments 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 FHA's actual historical experience regarding the performance of mortgage loans. The parameters of the econometric models are estimated over a wide variety of loans originated since 1990 and their performances corresponding to the range of economic conditions and mortgage market environments experienced during the past 20 years. The calibrated 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 30 years into the future. These projections are dependent upon the validity and robustness of the underlying models and the assumptions about future economic environment and loan characteristics. These assumptions include economic forecasts by Moody's Economy.com and assumptions concerning FHA's future endorsement portfolio volume and 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 three years into the most stressful economic conditions in recent history. As noted elsewhere in this Review, the entire country is in the midst of a widespread and severe house price decline and it is projected that prices will remain depressed for the next two years. 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 house price recession of the magnitude and scale currently being experienced. The model used in this Review takes the future projected house price declines into account when computing claim and prepayment rates.

Given that the current economic conditions and those expected to prevail over the near term are extremely stressful, it is worth discussing the ability of our models to perform properly in such an extreme environment. The models assume that certain general relationships that have been observed over a long historical period and under a wide variety of economic conditions will continue to hold in the future. However, it is possible that under the current extremely stressful environment, some new phenomena may emerge that change these relationships in a significant way and that could affect the projected claim and prepayment rates. At this time we are not aware of any convincing evidence that a change of this nature has occurred, but it is important to

continue to monitor the models to verify their performance and reliability. If such a change does take place, the projected future claims could be either higher or lower.

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. Because Moody's July 2010 economic forecast is more pessimistic, especially in the longer term, than the IHS Global Insight August 2009 economic forecast used in last year's Review, the economic values reported in this Review are lower than what was projected in the FY 2009 Review for FY 2010, and lower still for FY 2016. 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 are explored quantitatively in Section V.

B. Basic Data Inputs

The analysis in this Review uses a data extract from FHA's data warehouse as of March 31, 2010. Future economic conditions are based on July 2010 forecasts by Moody's Economy.com. Future endorsement volume and composition data are based on HUD's projections as of September 2010. The volume and composition of the existing portfolio are further updated by an extract of FHA data as of June 30, 2010. 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 does not render an opinion on the compliance of the total Fund performance regarding the 2 percent capital ratio required by the 1990 National Affordable Housing Act, because this Review did not analyze the Home Equity Conversion Mortgage (HECM) Program. The HECM program was included in the MMI Fund starting in FY 2009, but is analyzed separately by HUD. Throughout this Review, we have computed the economic value and the unamortized and amortized IIF for the "Fund," which we have stipulated includes all loans in the MMI Fund except for HECMs.

According to our estimates for the base-case economic scenario, the Fund has an economic value of $5.16 billion and unamortized IIF of $926.25 billion as of the end of FY2010. Furthermore, we project that the economic value will steadily increase after FY 2010 at an average of 33.79 percent per year to $39.58 billion by the end of FY 2017. Meanwhile, the unamortized IIF will also increase, at an average of 4.96 percent per year to the end of FY 2017. 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 2010 economic value was $2.72 billion lower than projected in last year's Review and the FY 2016 economic value was $7.04 billion lower than projected in last year's Review. If the future economic experience is worse than estimated in this Review, it is possible that the economic value will be negative in FY 2010 and possibly not become positive until the end of FY 2015.

As a result of the extremely stressful conditions during the last three years, the economic value of the Fund has declined to a very low level. Furthermore, under some of the projected scenarios the economic value of the Fund is projected to be negative and to remain low 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 negative. This could occur if there is an 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 2010, house prices are expected to remain weak through 2010. The future house price growth rates are slightly lower than those of the August 2009 forecast by IHS Global Insight in the short run. Also, Moody's average long-run annual house price growth rate among all MSAs of 2.8 percent is considerably more pessimistic than the 5.4 percent forecast by IHS Global Insight last year. The economic value of the Fund in future years has decreased significantly due to this slower forecast house price growth rate.

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, all 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-1990's, before the emergence of the subprime markets. The improved credit composition compared to what was projected last year and that of the recent and future books have significantly improved the projected performance of the Fund. This improvement in credit quality, along with the increase in FHA's mortgage insurance premiums, have nearly offset the decline due to the switch to the more pessimistic Moody's Economy.com economic forecast mentioned above.

One of this year's econometric model enhancements was the differentiation of the credit quality of active loans by their payment status. The enhanced model now distinguishes all active loans according to whether they are in default status, *i.e.*, 90-days or more delinquent, and explicitly models the transition of loans among the various possible states: current, default, prepayment, and claim. Incorporating the default status information reduces the Fund's economic value.

This year, more accurate information concerning the credit characteristics of streamline refinance loans was obtained by linking them to the original fully underwritten loans issued to the same borrower. The house price deterioration in the past few years indicates that the streamline refinance loans endorsed in the past two years tended to have higher current loan-to-value ratios and higher probabilities of negative equity. We have also incorporated the loss mitigation related expenses into the loss rate model. The change in loss rate modeling causes the economic value of the Fund to decrease.

The passage of HERA prohibits 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. This helps 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 $18.73 billion in FY 2010, a $13.57 billion improvement.

Appendix A

Econometric Analysis of Mortgage Terminations

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 2010 Review. A number of enhancements were made to the modeling details for this year's review. The most significant of these were the introduction of a mortgage status transition framework that accounts for the occurrence of 90-day default episodes for FHA mortgages, and the linking of streamline refinance mortgages to the prior fully underwritten mortgages to the same borrowers in order to estimate their current LTVs and other characteristics. We describe these modeling enhancements 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 review 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. Some new variables have been introduced for this year's review. These include policy-year indicators to account for the impact of the recent and ongoing mortgage crisis on FHA loan performance. An additional set of policy-year indicators were included to capture the historical development and implementation of FHA loss mitigation tools since 1991. We also discuss the development of new variables for modeling the performance of streamlined refinance mortgages that are based on linking the streamline refinance mortgages with the original fully-underwritten mortgage issued to the same borrower. 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

In previous years 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 and claim terminations.

FHA provided historical data on new 90-day default episodes that have occurred on outstanding mortgages beginning FY 1990 Q1. The date at which the loan was first reported to be 90-or-more days in arrears is used to identify the start of a default episode, which continues until the loan is reported to be less than 90-days in arrears or is terminated by a claim or a prepayment. For the purposes of our models, loans that enter a quarter in 90-days or more delinquent status 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. New default events occur during the previous quarter prior to the start of the current quarter. A loan is deemed to be in default status, unless terminated during that same previous quarter by a claim or prepayment, respectively.

We have been able to use these data on 90-day or greater delinquencies to develop and apply an expanded version of the original multinomial logit modeling approach that extends the two-equation active-to-claim or active-to-prepay framework applied in prior Reviews, to a six-equation framework that models transitions from current-to-default, current-to-prepay, current-to-claim, default-to-current, default-to-prepay, and default-to-claim. Exhibit A-1 summarizes both the traditional model (TM) used in prior years and status-transition (ST) approaches and describes the specific mortgage status transitions that we modeled for each approach.

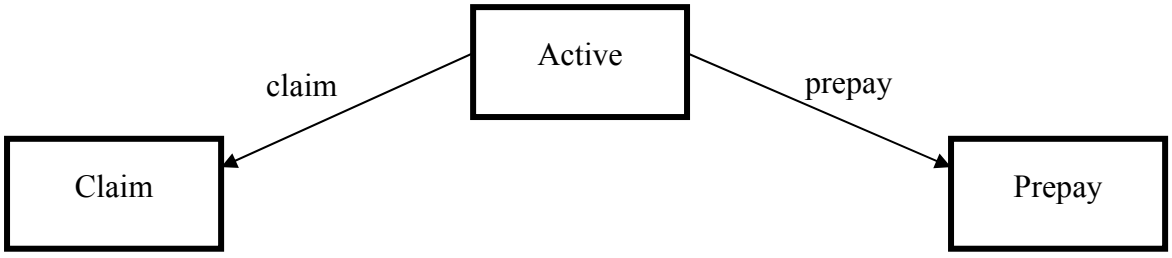
The typical situation where a loan experiences a new default event (starts a new 90-day default episode) and subsequently attains default status at the start of the next quarter is illustrated in Example 1 of Exhibit A-2. Loans that attain default status in this manner are those used to model the probability of default-to-claim, default-to-prepay, and default-to-cure events.

The case of current-to-claim transitions is illustrated in Example 2 of Exhibit A-2. In this case, a loan may be seriously delinquent, but slightly less than 90 days in arrears, at the start of a quarter and would be classified as "current." The loan may then proceed to foreclose and claim termination during that quarter. Thus, it would be classified as a claim in that quarter, even though it was in current status at the start of the quarter—it never attains default status in this case. In other words, although the loan must have started a new 90-day default episode at some point during the same quarter that it is classified as a claim, it may never have been previously classified as in a default status. This example demonstrates why we need to model current-to-claim transitions in addition to default-to-claim transitions. Prepayment transitions can, of course, occur for loans in either default status or current status at the start of the quarter.

As illustrated in Exhibit A-1, 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, this is not recorded as an arrearage 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 (start of 90-day default episode) can occur until the second quarter.

Exhibit A-1

Traditional Model (TM)
2-Transition / 3-Status Framework



Status-Transition (ST) Model
6-Transition / 4-Status Framework

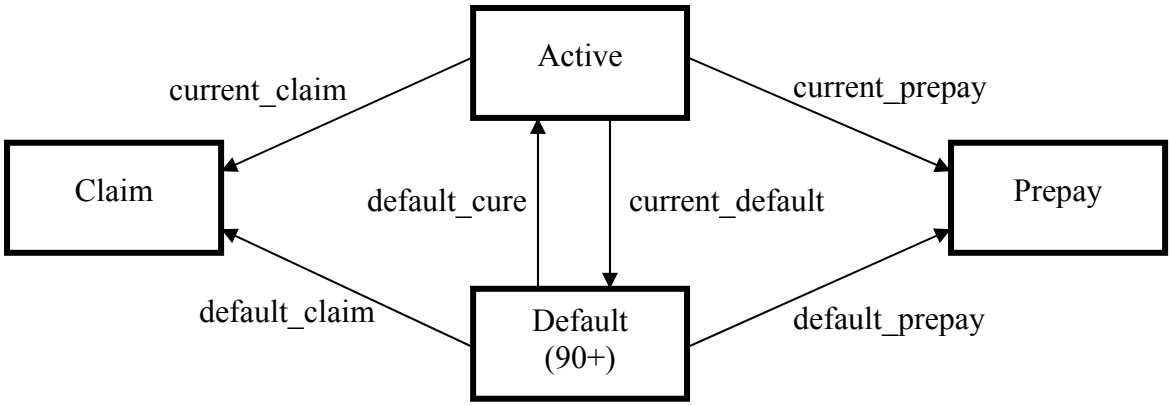
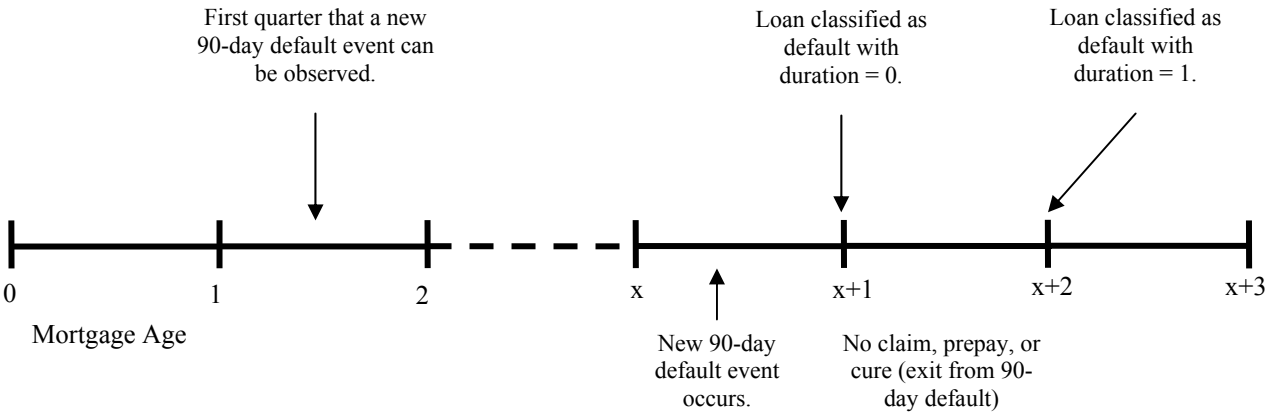


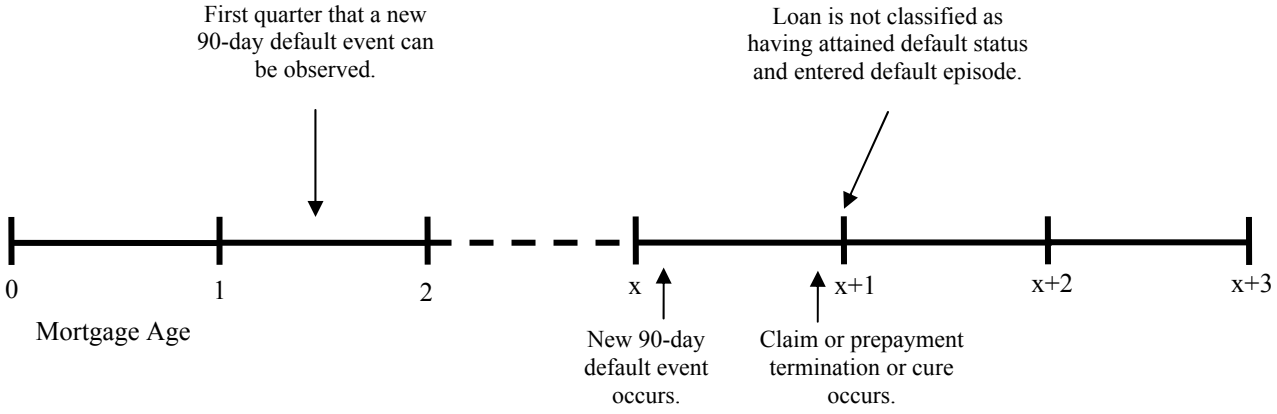
Exhibit A-2 illustrates how the default duration variable is updated following the occurrence of new default event and subsequent attainment of default status at the start of the next quarter.

Exhibit A-2

Example 1: Loan attains default status and that may result in transition from default to claim, prepayment, or cure in subsequent quarter.



Example 2: Loan has new 90-day default event, but terminates in claim or prepayment or returns to current status during the same quarter.



B. Specification of Multinomial Logit Models

As summarized above in Exhibit A-1, under the expanded status transition (ST) framework we have two sets of competing risks instead of one: 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 claim, prepayment, or transition to default status. For loans in default status at the start of the quarter, the competing risks are claim, prepayment, and transition to current status (cure). This gives rise to six possible transitions (or eight counting loans that continue to remain in either current or default status), requiring estimation of six sets of logit parameters for the ST model compared to the two sets of logit parameters required for the TM model. As in prior-year Reviews, we apply an approach suggested 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.[1]

The starting point for specification of the loan performance models was multinomial logit models of quarterly conditional probabilities for transitions from current to claim, 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 started in current status in a quarter t to claim, prepay, default, and remain current, respectively, in the subsequent quarter t + 1 are given by:

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

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

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

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

The corresponding equations for loans started in default status are given by:

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

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

[1] Interested readers are encouraged to review the FY 2009 report for full details on the approach applied in that year's review. The report can be found on the FHA website at:
http://www.hud.gov/offices/hsg/rmra/oe/rpts/actr/2009actr_exhecm.pdf

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

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

The constant terms α_f^i and coefficient vectors β_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* to the subsequent quarter indicating claim (CLM), prepayment (PRE), current (CUR) or default (DEF),. We denote by $X_f^i(t)$ the vector of explanatory variables for the conditional probability of making a transition from startingstatus *i* to endingstatus *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 and the duration of the default episode for loans in default status.

C. Computation of Multinomial Logit Parameters from Binomial Logit Parameters

Begg and Gray (1984) applied Bayes Law for conditional probabilities to demonstrate that the values of parameters α_f^i, α_f^i, β_f^i and β_f^i estimated from separate binomial logit (BNL) models are parametrically equivalent to those for the corresponding multinomial logit (MNL) model once the appropriate calculations are performed. Assume that the conditional probabilities for current-to-claim, 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:

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

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

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

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.

We can rearrange terms to solve for the numerator components $e^{\alpha_{CLM}^{CUR}+X_{CLM}^{CUR}(t)\beta_{CLM}^{CUR}}$, $e^{\alpha_{PRE}^{CUR}+X_{PRE}^{CUR}(t)\beta_{PRE}^{CUR}}$, and $e^{\alpha_{DEF}^{CUR}+X_{DEF}^{CUR}(t)\beta_{DEF}^{CUR}}$ of the multinomial model in terms of binomial probabilities $\Pi_{CLM}^{CUR}(t)$, $\Pi_{PRE}^{CUR}(t)$, and $\Pi_{DEF}^{CUR}(t)$, respectively:

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

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

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

Then we can substitute directly into the MNL probabilities shown in equations (1a) to (1c) for $e^{\alpha_{CLM}^{CUR}+X_{CLM}^{CUR}(t)\beta_{CLM}^{CUR}}$, $e^{\alpha_{PRE}^{CUR}+X_{PRE}^{CUR}(t)\beta_{PRE}^{CUR}}$, and $e^{\alpha_{DEF}^{CUR}+X_{DEF}^{CUR}(t)\beta_{DEF}^{CUR}}$:

$$\pi_{CLM}^{CUR}(t) = \frac{\dfrac{\Pi_{CLM}^{CUR}(t)}{(1-\Pi_{CLM}^{CUR}(t))}}{1+\dfrac{\Pi_{CLM}^{CUR}(t)}{(1-\Pi_{CLM}^{CUR}(t))}+\dfrac{\Pi_{PRE}^{CUR}(t)}{(1-\Pi_{PRE}^{CUR}(t))}+\dfrac{\Pi_{DEF}^{CUR}(t)}{(1-\Pi_{DEF}^{CUR}(t))}} \tag{5a}$$

$$\pi_{PRE}^{CUR}(t) = \frac{\dfrac{\Pi_{PRE}^{CUR}(t)}{(1-\Pi_{PRE}^{CUR}(t))}}{1+\dfrac{\Pi_{CLM}^{CUR}(t)}{(1-\Pi_{CLM}^{CUR}(t))}+\dfrac{\Pi_{PRE}^{CUR}(t)}{(1-\Pi_{PRE}^{CUR}(t))}+\dfrac{\Pi_{DEF}^{CUR}(t)}{(1-\Pi_{DEF}^{CUR}(t))}} \tag{5b}$$

$$\pi_{DEF}^{CUR}(t) = \frac{\dfrac{\Pi_{DEF}^{CUR}(t)}{(1-\Pi_{DEF}^{CUR}(t))}}{1+\dfrac{\Pi_{CLM}^{CUR}(t)}{(1-\Pi_{CLM}^{CUR}(t))}+\dfrac{\Pi_{PRE}^{CUR}(t)}{(1-\Pi_{PRE}^{CUR}(t))}+\dfrac{\Pi_{DEF}^{CUR}(t)}{(1-\Pi_{DEF}^{CUR}(t))}} \tag{5c}$$

A similar set of calculations produces the following corresponding set of multinomial logit probabilities for loans in default status at the start of quarter *t*:

$$\pi_{CLM}^{DEF}(t) = \frac{\frac{\Pi_{CLM}^{DEF}(t)}{(1-\Pi_{CLM}^{DEF}(t))}}{1+\frac{\Pi_{CLM}^{DEF}(t)}{(1-\Pi_{CLM}^{DEF}(t))}+\frac{\Pi_{PRE}^{DEF}(t)}{(1-\Pi_{PRE}^{DEF}(t))}+\frac{\Pi_{CUR}^{DEF}(t)}{(1-\Pi_{CUR}^{DEF}(t))}} \tag{6a}$$

$$\pi_{PRE}^{DEF}(t) = \frac{\frac{\Pi_{PRE}^{DEF}(t)}{(1-\Pi_{PRE}^{DEF}(t))}}{1+\frac{\Pi_{CLM}^{DEF}(t)}{(1-\Pi_{CLM}^{DEF}(t))}+\frac{\Pi_{PRE}^{DEF}(t)}{(1-\Pi_{PRE}^{DEF}(t))}+\frac{\Pi_{CUR}^{DEF}(t)}{(1-\Pi_{CUR}^{DEF}(t))}} \tag{6b}$$

$$\pi_{CUR}^{DEF}(t) = \frac{\frac{\Pi_{CUR}^{DEF}(t)}{(1-\Pi_{CUR}^{DEF}(t))}}{1+\frac{\Pi_{CLM}^{DEF}(t)}{(1-\Pi_{CLM}^{DEF}(t))}+\frac{\Pi_{PRE}^{DEF}(t)}{(1-\Pi_{PRE}^{DEF}(t))}+\frac{\Pi_{CUR}^{DEF}(t)}{(1-\Pi_{CUR}^{DEF}(t))}} \tag{6c}$$

Equations (5a)-(5c) and (6a)-(6c) were used to derive the corresponding MNL probabilities directly from separately estimated BNL probabilities.

D. Loan Transition and Event Data

We used loan-level data to construct quarterly loan event histories by combining mortgage origination information with contemporaneous values of time-dependent factors. In the process of creating quarterly event histories, each loan contributed an 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. The term "transition" is used here to refer to any situation in which a loan remains active and the loan status changes at 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 additional data fields updating the timing of 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, 2010. The dataset was first filtered for loans with missing or invalid values of key variables in our econometric model. In addition, we excluded a subset of historical loans where the payoff status of the loans was never updated, or for which FHA had assigned a special servicer identification code. Most of the latter types of loans were believed to have already been prepaid, but the servicing records were never updated. Since FY 2004, HUD has been investigating and updating the data records of these loans. As in prior reviews, any surviving loans from these servicers were deleted from the sample used for model estimation based on statistical analysis that confirmed there would be no material impact on the final econometric estimates.

E. Data Samples

A full 100-percent sample of loan-level data from the FHA single-family data warehouse was extracted for the FY 2010 analysis. This produced a very large sample of approximately 24.5 million single-family loans originated between the first quarter of FY 1975 and the first quarter of FY 2010. We ultimately decided to use data for the 18.5 million loans originated during FY 1990 and later years 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 minimum of 120 quarters (30 years) of loan life, the age at which the loan would mature based on the original term of the loan, or 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 6 transition probabilities to estimate for 6 loan product types, for 36 total equations to estimate. By way of comparison in last year's Review there were 2 transition probabilities for 6 loan product types, or 12 total equations.

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	100 percent
Product 5	FRM15_SR	50 percent
Product 6	ARM_SR	50 percent

II. Explanatory Variables

Four main categories of explanatory variables were employed:

1. 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, relative house price level, original loan amount, original mortgage interest rate, and geographic location (MSA, state, Census division);

2. 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);

3. Dynamic variables based entirely on loan information including mortgage age, duration of default episode, season of the year, and scheduled amortization of the loan balance and

4. 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.

For the FY 2010 Actuarial Review additional policy-year variables were added to recognize the development and implementation of new FHA loss mitigation tools since 1991. In last year's Review we added a policy-year variable to account for the impact of the rapid expansion of the subprime market during 2004 to 2006. An additional policy-year variable has been added for this year's Review to capture the current and ongoing mortgage crisis from 2007 forward.

Exhibits A-3.1 to 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 36 binomial logit models. All of the variables except for the mortgage age and default duration 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. Some additional details on each set of variables are provided below.

Mortgage Product Types

As described above, separate statistical models were estimated for 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

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:

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

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

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

$$\text{age4} = \begin{cases} 0 & \text{if AGE} \le k_3 \\ \text{AGE} - k_3 & \text{if } k_3 < \text{AGE} \le k_4 \\ k_4 - k_3 & \text{if AGE} > k_4 \end{cases}$$

$$\text{age5} = \begin{cases} 0 & \text{if AGE} \le k_4 \\ \text{AGE} - k_4 & \text{if } k_4 < \text{AGE} \le k_5 \\ k_5 - k_4 & \text{if AGE} > k_5 \end{cases} \qquad (7)$$

$$\text{age6} = \begin{cases} 0 & \text{if AGE} \le k_5 \\ \text{AGE} - k_5 & \text{if AGE} > k_5 \end{cases}$$

Coefficient estimates corresponding to the slopes of the line segments between each knot point and for the last line segment were estimated for each product and transition type combination and reported in Exhibit A-3. The overall AGE function for the 6-age segment example described above is given by:

$$\text{Age Function} = \beta_1 \cdot \text{age1} + \beta_2 \cdot \text{age2} + \beta_3 \cdot \text{age3} + \beta_4 \cdot \text{age4} + \beta_5 \cdot \text{age5} + \beta_6 \cdot \text{age6} \qquad (8)$$

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 of Piece-Wise Linear Functions for Default Durations

A similar approach was applied to control for default episode durations for loans in default status at the start of a quarter. After some testing, we decided to create separate duration categories for durations 1, 2, 3, 4, and 5 or more quarters. This approach was adopted to constrain the dimensions of the matrix of transition probabilities to be generated during forecasting 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. The piece-wise linear spline segment of this group was then constrained to have zero slope. This implies that the duration function will "level off" and be flat for durations 5 and higher, and the level the function has attained by duration 5 will apply to all higher durations, if the loan should survive and continue in default status to these higher durations.

Relative House Price

As in last year's Review we used a variable measuring the relative house price level within the local market. 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. HUD provided us with Census median house price data at the county and metropolitan Core Based Statistical Area (CBSA) levels for the years 1980, 1990, 2000, and annually for 2006-2009. Quarterly median price estimates for 1980 to 2009 were derived through linear interpolation. Quarterly median values to 2010 were derived by extrapolating from the end of the series in 2009. For hypothetical loan cohorts originated after 2010, we applied annual growth rate assumptions consistent with the macroeconomic forecasts used when projecting the future performance of the MMI Fund. The CBSA median prices 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.

Loan Size

Loan size is defined relative to the average-sized FHA loan originated in the same state during the same fiscal year. The resulting values were stratified into 5 categories based on direct examination of the data, with the middle category, *category 3*, centered on the average-sized loans plus or minus 10 percent, *i.e.*, 90 to 110 percent of the average loan size.

Loan-to-Value Ratio

Initial loan-to-value is recorded in FHA's data warehouse. For fully-underwritten mortgage products these LTV values are used directly. In prior Reviews, we have not used the recorded LTV values for streamline refinance loans, based on discussions with FHA that any LTV values recorded for streamline refinance products may refer to values recorded at the time of the original FHA loan and were considered unreliable for use in the analysis. Previously, we imputed original LTV values for these loans based on those of non-streamline loans in the same state for the purpose of establishing the starting point for tracking the evolution of the probability of negative equity (see description of this variable below). For this year's Review, we have linked the streamline refinance loans with the original fully underwritten FHA mortgage to the same borrower, and use 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. We also tested using the original LTVs from the fully-underwritten mortgages directly as explanatory variables for streamline refinance loans, but the resulting estimates did not provide statistically significant results.

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).

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 follows:

$$PNEQ = \Phi\left\{\frac{\ln(UPB(t)) - \ln(P(0)\cdot HPI(t))}{\sigma(t)}\right\} \qquad (9)$$

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 percentage change in 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:

$$\sigma(t) = \sqrt{a \cdot t + b \cdot t^2} \ . \tag{10}$$

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 seven levels ranging from less than 5-percent to more than 30-percent probability of negative equity as listed in Exhibit A-3. Further mathematical details are presented in Appendix C of this Review.

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 and the current market mortgage rate:

$$MP(t) = \left\{ \frac{C(t) - R(t)}{C(t)} \right\}. \tag{11}$$

Where *C(t)* is the current note rate on the mortgage and *R(t)* is the current market average fixed-rate mortgage rate. 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 needed to track 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:

$$\begin{aligned} C(t) = max\{ & min[\, Index(t-S) + Margin, \\ & C(t-1) + A(t) \cdot Period\_UpCap, C(0) + Life\_UpCap\,], \\ & C(t-1) - A(t) \cdot Period\_DownCap(t), max(C(0) - Life\_DownCap, Life\_Min)\} \end{aligned} \tag{12}$$

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 $Life\_Down\_Cap$, 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 (12).

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, unmeasured differences in borrower equity at the loan level may give rise to unobserved heterogeneity that can impact both prepayment and claim rates. Borrowers with negative equity are less likely to prepay due to the difficulty of qualifying and are more likely to exercise the default option.

Changes were introduced to the burnout factor for the FY 2006 Review and continue to be applied in the FY 2010 Review. The previous burnout factor, which was identical to that used in the FHFA risk-based capital stress test model, took the value one if the mortgage note rate exceeds the market mortgage rate by 200 basis points or more in any two of the preceding eight quarters. Empirical evidence now suggests that borrowers who refinance tend to do so at much lower thresholds. The burnout factor is quantified as the moving average number of basis points the borrower was in the money, 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 categorized into 100 basis point categories indicating market average FRM mortgage rates of 6 percent or less up to a category for market average FRM rates exceeding 10 percent.

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. Loans to borrowers utilizing downpayment assistance from non-profit organizations have been observed to generate significantly higher claim rates. As noted in Section I, these risky loans will be eliminated going forward. Following the approach first applied in the FY 2006 Review, we have included in this year's Review a series of indicators to control for the use of different types of downpayment assistance by FHA borrowers. Note, however, that 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 mortgages to apply when estimating the transition models for streamline refinance loans. Thus, a streamline refinance loan originated in FY 2009, FY 2010 and the next few years 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.

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 dated during FYs 1992, 1994, and 1996. FICO scores of the 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. 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. FICO scores derived in this manner were further stratified into categorical outcomes for use in the estimation models.

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 originated in FY 1992 or later that were 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 in FY 1992 or later for which no attempt was made to obtain the FICO score.

Through the process of linking streamline refinance loans to the original fully underwritten FHA mortgages to the same borrowers for the FY 2010 Review, we developed a parallel set of FICO score indicators and include 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, less than 100-percent random samples were used for estimation of loan status transition models for some loan products. In this case, a stratified random sampling scheme was applied to assure adequate representation of loans with historical FICO score data. For each fiscal year the Unicon sample loans were flagged and the total counts of Unicon loans and other FHA loans were computed. Separate sampling rates for Unicon loans and other FHA loans were derived to give as close to equal representation of both loan samples as possible, while still achieving the specified overall sampling rate for the particular product in each fiscal year. Individual sampling weights were assigned to each loan based on the reciprocal of their probability of selection. In some years this resulted in selecting the entire sample of available Unicon sample loans, with the remainder of the random sample comprising FHA loans not included in the Unicon samples. In other years, this resulted in selecting a random subsample of Unicon sample loans and an equally-sized random sample of other FHA loans. Our goal was to attain a balanced mix of loans with and without FICO scores (for those years in which FICO scores were potentially available) in order to analyze the impact of credit scores on loan performance and to control for choice-based sampling of FICO scores by comparison to loan performance in a random sample of FHA loans. Under the approach outlined here the estimation data included a mix of randomly sampled FHA loan originations without FICO scores and a choice-based sample of loans with FICO scores prior to 2004, and randomly sampled FHA loans with FICO scores (collected directly by FHA) since late 2004.

Estimation using only observations from a choice-based sample is known to result in biased estimation of the constant terms of maximum-likelihood logit probability models, but still gives unbiased estimates of the coefficients of the explanatory variables. The standard correction for bias in the intercept terms depends on the relative population and sample proportions of the selected outcome (Costlett, 1981). It is not feasible to apply this type of correction in our case, as the original procedure was applied to a sample of FHA loan "applications," not all of which resulted in originated loans endorsed for FHA insurance. Furthermore, we were not able to access the original Unicon sampling weights applied to the population of loan applications. However, we do benefit from the fact that we have available the full "population" of FHA at-risk insured loans, which allows us to directly estimate differences in performance among loans in the choice-based samples. We have controlled directly for the differences in loan performance across our two sources of FICO score information by including an indicator for whether the loan was included in the Unicon loan subsample, along with a series of indicator variables that account for the availability and source of FICO scores across different origination years.

Origination Year Indicators

The series of origination year indicators applied in past Reviews to account for changes in FHA underwriting requirements has been modified and extended to account for the periods during which loan-level credit score data were or were not available.

FY 1975-1986 Originations

In prior year's reviews, we applied an indicator for loans originated prior to FY 1986 Q3 to account for the period prior to tightening of FHA underwriting requirements. This year's review uses data for loans endorsed for insurance beginning in 1990, corresponding to the period of availability of the data on 90-day default episodes, to estimate the models. Accordingly, this variable no longer appears in the models.

FY 1986-1992 Originations

An indicator for loans originated between FY 1986 Q3 and FY 1991 Q4 is included to capture the condition that these loans were underwritten with more strict requirements but had no borrower credit history information. This variable also corresponds to the last period prior to the availability of borrower credit score data. Due to the use of data for loans endorsed for insurance in FY 1990 and later years, this variable now corresponds to the period from FY 1990 Q1 to FY 1991 Q4.

FY 1992-1995 Originations

This period corresponds to the period of continued strict FHA underwriting, but includes the first years that credit score data are 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.

Post-FY 1996 Originations

An indicator for loans originated since FY 1996 Q1 is included to account for a loosening of FHA underwriting requirements.

Development and Application of New Loss Mitigation Tools by FHA

FHA has identified the period from 1996 to 2001 as a period of development of new loss mitigation policies and procedures, which have been applied since 2002. We have created two additional policy-year indicators to control for these two periods. The second variable covers the

period from 2002 to 2004 only, since we apply additional policy-year indicators during later years.

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.

Mortgage Crisis Period

The period since 2007 corresponds to the current and ongoing mortgage crisis, which has resulted in dramatic developments in terms of house prices, mortgage underwriting standards, contraction of private mortgage insurance, and rapid growth and changes in composition of the FHA single-family portfolio. We include an additional policy-year indicator to help measure any significant departures of the models that are not captured by the included borrower-level variables. The effect of this variable on future forecasts is gradually phased out over the period from FY 2012 through FY 2013 and is completely eliminated by FY 2014 Q1.

New Variables for Streamline Refinance Mortgages

Another enhancement to this year's approach was the linking of streamlined refinance mortgage 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 it 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 the original fully underwritten loan 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 can obtain the original LTV and property values and update 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 are also able to assign indicators of downpayment assistance type to current streamline mortgages based on the original fully-underwritten mortgage and to include this variable in the models for streamline mortgage products. Although non-profit downpayment assistance programs have been greatly limited since 2008, it could be the case that streamline refinance mortgages originated in 2009 or 2010 had original loans from the earlier period that we identified as having this type of downpayment assistance. To clarify, this indicator refers specifically to the form of downpayment assistance on the prior fully underwritten mortgage and is included to capture any residual impact on the streamline refinance mortgage.

Finally, we develop indicators of the loan product type of the prior fully-underwritten mortgages to include as an additional explanatory variable in the status transition models for streamline refinance loans. The baseline category in this case is fully-underwritten 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 ST model. For this year's Review we have 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**	**current_claim**	**default_cure**	**default_prepay**	**default_claim**
Relative house price measured as percentage of Census median house value during quarter of loan origination.	rel_hp_cat_1	0 < X ≤ 50						
	rel_hp_cat_2	50 < X ≤ 75	0.0205	0.2567	-0.1975	0.0138	0.0534	-0.0204
	rel_hp_cat_3	75 < X ≤ 100	-0.0247	0.4492	-0.2113	0.0512	0.0762	-0.0539
	rel_hp_cat_4	100< X ≤ 125	-0.0563	0.5482	-0.3264	0.0559	0.0403	-0.0609
	rel_hp_cat_5	125< X ≤ 150	-0.0944	0.5847	-0.2266	0.0583	-0.0742	-0.0304
	rel_hp_cat_6	X > 150	-0.0426	0.5371	-0.2429	0.0550	-0.1705	0.0978
Loan-to-value at origination.	ltvcat_cat_1	0 < X ≤ 80						
	ltvcat_cat_2	80 < X ≤ 90	0.1707	0.0766	0.5527	-0.0863	-0.2111	0.1706
	ltvcat_cat_3	90 < X ≤ 95	0.2756	0.2899	0.6117	-0.1984	-0.1479	0.2524
	ltvcat_cat_4	95 < X < 97	0.2592	0.3455	0.8061	-0.2416	-0.1066	0.2840
	ltvcat_cat_5	97 ≤ X	0.2036	0.2914	0.7332	-0.2284	-0.2098	0.2271
Refinance loan.	refinance_cat_2	Refinance	0.0611	0.2160	0.1631	0.1178	0.0244	0.1421
Season of event exposure in calendar quarter.	season_cat_1	X = 1						
	season_cat_2	X = 2	-0.0246	0.1542	-0.1440	-0.1440	0.1877	-0.0190
	season_cat_3	X = 3	0.1668	0.0721	-0.0237	-0.3124	0.1508	-0.0405
	season_cat_4	X = 4	0.2047	0.0673	0.3347	0.5415	0.1546	0.0619
Probability of negative equity. Based on FHFA house price drift and volatility estimates.	pneqcat_cat_1	0.00 ≤ X ≤ 0.05						
	pneqcat_cat_2	0.05 < X ≤ 0.10	0.1390	-0.3968	0.6383	-0.0635	-1.1058	0.3968
	pneqcat_cat_3	0.10 < X ≤ 0.15	0.1776	-0.5180	0.7189	-0.0308	-1.4172	0.5285
	pneqcat_cat_4	0.15 < X ≤ 0.20	0.2027	-0.6275	0.9406	-0.0061	-1.6155	0.6136
	pneqcat_cat_5	0.20 < X ≤ 0.25	0.2502	-0.7361	1.1013	-0.0341	-1.9237	0.7072
	pneqcat_cat_6	0.25 < X ≤ 0.30	0.3353	-0.8556	1.0303	0.0503	-2.0211	0.6303
	pneqcat_cat_7	X > 0.30	0.5844	-0.6978	1.2550	0.1655	-2.3187	0.7420
Mortgage premium value measured as difference between current coupon rate and average FRM market rate, divided by current coupon rate.	spreadcat_cat_1	X ≤ -30						
	spreadcat_cat_2	-30 < X ≤ -20						
	spreadcat_cat_3	-20 < X ≤ -10						
	spreadcat_cat_4	-10 < X ≤ 0	0.0498	0.0172	0.0809	-0.2219	-0.1479	-0.0226
	spreadcat_cat_5	0 < X ≤ 10	0.1437	0.1837	0.4370	-0.3834	-0.1098	-0.0323
	spreadcat_cat_6	10 < X ≤ 20	0.2863	0.7767	0.5586	-0.3099	-0.0588	-0.0291
	spreadcat_cat_7	20 < X ≤ 30	0.3777	1.1055	0.6637	-0.1948	-0.0450	-0.0154
	spreadcat_cat_8	X > 30	0.5198	0.9888	0.9286	-0.0100	-0.0615	0.0705
Yield curve slope measured as ratio of 10-year CMT to 1-year CMT rates.	ycslopecat_cat_1	0.0 ≤ X ≤ 1.0						
	ycslopecat_cat_2	1.0 < X ≤ 1.2	-0.0500	-0.0493	-0.8474	0.0286	-0.2350	0.0397
	ycslopecat_cat_3	1.2 < X ≤ 1.5	0.0357	0.1507	-0.5561	0.5279	-0.1988	0.0724
	ycslopecat_cat_4	X > 1.5	0.0200	0.3008	-1.1613	0.3210	-0.2794	0.0833
Burnout factor equal to moving average number of basis points prepayment option was in the money during quarters in the money over preceding 8 quarters.	in_moneycat_cat_1	X ≤ 0						
	in_moneycat_cat_2	0 < X ≤ 50	0.0961	0.2329	0.1680	0.2536	0.0651	0.0491
	in_moneycat_cat_3	50 < X ≤ 100	0.2776	0.4872	0.3030	0.3268	0.1493	0.0581
	in_moneycat_cat_4	100 < X ≤ 150	0.4984	0.5809	0.5943	0.3227	0.1919	0.0684
	in_moneycat_cat_5	150 < X ≤ 200	0.6669	0.5144	0.8404	0.2257	0.2342	0.0118
	in_moneycat_cat_6	X > 200	0.8871	0.5193	1.3211	0.0371	0.1823	-0.0099
Cohort years. FHA underwriting changes.	fy_1986_1992_cat_2	1986 ≤ X ≤ 1992	-0.4034	-0.2182	1.3173	-0.9712	0.3158	0.0863
Cohort years. FHA underwriting changes.	fy_1993_1995_cat_2	1993 ≤ X ≤ 1995						
Cohort years. FHA underwriting changes.	fy_1996_XXXX_cat_2	X ≥ 1996	0.3445	-0.0736	-0.0287	0.2577	-0.1939	-0.1874

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

Variable			Status Transition (from_to)					
Policy years. Loan modification tools.	lm_2002_2003_cat_2	2002 ≤ X ≤ 2003	0.5924	0.7635	0.9052	-0.5607	0.4640	-0.1960
Policy years. Subprime market expansion.	sp_2004_2006_cat_2	2004 ≤ X ≤ 2006	0.7242	0.5972	0.5280	-0.4718	0.8052	-0.0834
Policy years. Housing crisis.	df_2007_XXXX_cat_2	X ≥ 2007	0.6745	0.0030	2.3064	-0.4954	-0.0956	-0.5426
Downpayment assistance and gift letter source.	gift_ltr_src_cat_1	None, Other						
	gift_ltr_src_cat_2	Relatives	0.3002	0.0528	0.2729	0.0393	0.0854	-0.0496
	gift_ltr_src_cat_3	Non-Profit	0.5511	-0.0165	0.6320	0.0352	-0.3815	0.2840
	gift_ltr_src_cat_4	Government	0.3707	-0.2353	0.5627	-0.0279	-0.4668	0.0367
Judicial or non-judicial foreclosure state.	judicial_cat_2	Judicial	0.0234	-0.1552	0.0224	-0.0964	-0.1513	-0.3103
FICO score categories.	fico_300_499	300 < X ≤ 499	1.1259	-0.2088	1.3574	-0.1825	-0.1563	-0.2510
	fico_500_559	500 < X ≤ 559	0.6654	-0.1315	0.5459	-0.1058	-0.0977	-0.2227
	fico_560_599	560 < X ≤ 599	0.3365	-0.0817	0.2382	-0.0590	-0.0571	-0.1158
	fico_600_639	600 < X ≤ 639						
	fico_640_659	640 < X ≤ 659	-0.4099	0.0717	-0.2662	0.0099	0.0982	0.2094
	fico_660_679	660 < X ≤ 679	-0.7286	0.0942	-0.4724	-0.0482	0.1835	0.3580
	fico_680_719	680 < X ≤ 719	-1.0975	0.1637	-0.7379	0.0241	0.3172	0.3519
	fico_720_850	720 < X ≤ 850	-1.7919	0.2240	-0.9341	-0.0352	0.4836	0.5149
Missing FICO indicators for loans originate 1992 and later and potentially available for scoring.	fico_000	No score generated on loan submitted for scoring by Unicon.	0.0351	-0.0901	0.3738	-0.2173	0.0037	0.2081
	fico_999	Loan not submitted for scoring or from time period without scores.	-0.3524	-0.2429	0.7721	-0.7314	0.3931	-0.2898
Loan was sampled from subset of FHA loans Unicon Corp submitted to credit repositories to obtain FICO information.	unicon_loan	Loan sampled from Unicon subsample.	0.1172	-0.3644	1.5473	-0.8783	0.1782	0.3121
Mortgage age function.	age1	Age spline function knot values given in respective columns to the right next to the corresponding coefficient estimates.	2 0.5846	2 0.8747	2 1.1058	4 0.1633	4 0.0456	4 0.1830
Piece-wise linear spline for ages up to specified knot points (shown as the number of quarters since origination).	age2		4 0.1722	4 0.2673	4 1.0448	8 0.1335	8 0.0536	8 0.0937
	age3		8 0.0739	8 0.0550	8 0.2054	12 -0.0057	12 0.0146	12 0.0164
	age4		12 0.0074	12 -0.0098	12 0.0222	16 0.0467	16 -0.0036	16 0.0043
Estimated coefficient gives the slope of the function for each linear segment.	age5		36 -0.0053	16 -0.0388	36 -0.0221	20 0.0437	20 -0.0189	20 -0.0055
	age6		>36 -0.0200	>16 -0.0264	>36 -0.0609	>20 0.0181	>20 -0.0069	>20 -0.0253
Default duration function.	deftime1	Default duration spline function knot values given in respective columns to the right next to the corresponding coefficient estimates.				1 -0.0654	1 -0.1732	1 1.2399
Piece-wise linear spline for durations (quarters) up to specified knot points.	deftime2					2 -0.2505	2 -0.1088	2 0.4938
	deftime3					3 -0.2011	3 -0.2333	3 0.2032
Estimated coefficient gives the slope of the function for each linear segment.	deftime4					4 -0.5337	4 -0.1314	4 -0.2060
	deftime5					≥ 5 0.0000	≥ 5 0.0000	≥ 5 0.0000
Intercept term.	constant	1	-7.0898	-6.9604	-16.1901	-2.0075	-3.5541	-5.1142
Estimation Sample Count	N	Total	8,200,864	8,379,871	8,035,339	546,012	487,631	517,254
- Log Likelihood (model)	L1		-729,430.86	-1,336,185.30	-16,647.47	-203,113.32	-54,046.52	-120,483.37
- Log Likelihood (constant)	L0		-774,996.57	-1,449,509.20	-18,425.11	-216,710.40	-58,547.15	-130,325.73
Degrees of Freedom	d.f.	L1 - L0 parameters	59	59	59	63	63	63
Chi-Squared Test Value	Chi-square	- 2*(L0-L1)	91,131	226,648	3,555	27,194	9,001	19,685

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**	**current_claim**	**default_cure**	**default_prepay**	**default_claim**
Relative house price measured as percentage of Census median house value during quarter of loan origination.	rel_hp_cat_1	0 < X ≤ 50						
	rel_hp_cat_2	50 < X ≤ 75	-0.0150	0.1771	0.4444	-0.1106	0.1199	-0.0707
	rel_hp_cat_3	75 < X ≤ 100	-0.1029	0.2824	0.3598	-0.0736	0.2053	-0.1845
	rel_hp_cat_4	100< X ≤ 125	-0.1048	0.3603	-0.0944	-0.0711	0.2735	-0.3147
	rel_hp_cat_5	125< X ≤ 150	-0.0481	0.3617	-1.3337	-0.1131	0.2164	-0.2256
	rel_hp_cat_6	X > 150	-0.3291	0.3611	-0.8027	-0.0096	0.1747	-0.0537
Loan-to-value at origination.	ltvcat_cat_1	0 < X ≤ 80						
	ltvcat_cat_2	80 < X ≤ 90	0.2926	0.0929	0.7008	-0.1071	-0.1364	0.4647
	ltvcat_cat_3	90 < X ≤ 95	0.4714	0.1385	1.3040	-0.1379	-0.3126	0.5397
	ltvcat_cat_4	95 < X < 97	0.4773	0.1649	1.3665	-0.1127	-0.2097	0.7586
	ltvcat_cat_5	97 ≤ X	0.4759	0.1468	1.2153	-0.1288	-0.3069	0.6473
Refinance loan.	refinance_cat_2	Refinance	-0.1934	0.0876	-0.7302	-0.0390	-0.1361	-0.2021
Season of event exposure in calendar quarter.	season_cat_1	X = 1						
	season_cat_2	X = 2	-0.0490	0.0083	0.0394	0.0048	-0.1797	-0.1535
	season_cat_3	X = 3	0.1602	-0.0023	0.2855	-0.1530	0.0109	-0.2426
	season_cat_4	X = 4	0.1558	-0.1680	0.1671	-0.2771	-0.2980	-0.2260
Probability of negative equity. Based on FHFA house price drift and volatility estimates.	pneqcat_cat_1	0.00 ≤ X ≤ 0.05						
	pneqcat_cat_2	0.05 < X ≤ 0.10	0.0035	-0.2540		-0.1686	-0.7579	0.2730
	pneqcat_cat_3	0.10 < X ≤ 0.15	0.2151	-0.4463		-0.2698	-0.8279	0.2730
	pneqcat_cat_4	0.15 < X ≤ 0.20	0.1745	-0.5249		-0.2698	-0.8279	0.2730
	pneqcat_cat_5	0.20 < X ≤ 0.25	0.1285	-0.5708		-0.2698	-0.8279	0.2730
	pneqcat_cat_6	0.25 < X ≤ 0.30	0.3070	-0.7608		-0.2698	-0.8279	0.2730
	pneqcat_cat_7	X > 0.30	0.4622	-0.3334		-0.2698	-0.8279	0.2730
Mortgage premium value measured as difference between current coupon rate and average FRM market rate, divided by current coupon rate.	spreadcat_cat_1	X ≤ -30						
	spreadcat_cat_2	-30 < X ≤ -20	0.0343					
	spreadcat_cat_3	-20 < X ≤ -10	0.1633					
	spreadcat_cat_4	-10 < X ≤ 0	0.3475	0.2460		-0.1181	0.1654	0.1728
	spreadcat_cat_5	0 < X ≤ 10	0.4362	0.5019		-0.1158	0.1654	0.0766
	spreadcat_cat_6	10 < X ≤ 20	0.5738	0.8919		-0.3350	0.1654	0.0817
	spreadcat_cat_7	20 < X ≤ 30	0.6105	1.1433		-0.4479	0.1654	0.1776
	spreadcat_cat_8	X > 30	0.7494	1.2373		-0.5119	0.5094	0.1868
Yield curve slope measured as ratio of 10-year CMT to 1-year CMT rates.	ycslopecat_cat_1	0.0 ≤ X ≤ 1.0						
	ycslopecat_cat_2	1.0 < X ≤ 1.2	0.0014	-0.1075	-0.1957	0.0598	-0.2282	0.0369
	ycslopecat_cat_3	1.2 < X ≤ 1.5	0.0308	-0.1948	-0.4530	0.1430	0.1927	-0.1084
	ycslopecat_cat_4	X > 1.5	-0.0366	-0.0237	-0.7167	-0.1272	-0.1824	-0.1518
Burnout factor equal to moving average number of basis points prepayment option was in the money during quarters in the money over preceding 8 quarters.	in_moneycat_cat_1	X ≤ 0						
	in_moneycat_cat_2	0 < X ≤ 50	0.0969	0.0740	0.2445	-0.0283	-0.3620	-0.1834
	in_moneycat_cat_3	50 < X ≤ 100	0.2654	0.0175	0.6233	-0.1164	-0.3386	-0.1834
	in_moneycat_cat_4	100 < X ≤ 150	0.4208	-0.1361	1.2524	-0.1532	-0.1821	-0.2971
	in_moneycat_cat_5	150 < X ≤ 200	0.4964	-0.3509	1.4591	0.0522	-0.1811	-0.3757
	in_moneycat_cat_6	X > 200	0.6842	-0.3547	1.4728	-0.1209	-0.1383	-0.4640
Cohort years. FHA underwriting changes.	fy_1986_1992_cat_2	1986 ≤ X ≤ 1992	-1.0186	0.1174	-0.3499	-0.0888	1.0020	-0.6418
Cohort years. FHA underwriting changes.	fy_1993_1995_cat_2	1993 ≤ X ≤ 1995						
Cohort years. FHA underwriting changes.	fy_1996_XXXX_cat_2	X ≥ 1996	0.2709	-0.0296	-0.5231	0.1263	-0.8849	0.2519

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

Variable			Status Transition (from_to)					
Description	**Name**	**Values**	**current_default**	**current_prepay**	**current_claim**	**default_cure**	**default_prepay**	**default_claim**
Policy years. Loan modification tools.	lm_1996_2001_cat_2	1996 ≤ X ≤ 2001	0.3253	0.2457	-0.2456	-0.3418	0.4031	-0.9098
Policy years. Loan modification tools.	lm_2002_2003_cat_2	2002 ≤ X ≤ 2003	0.5941	0.5368	0.0816	-0.0191	0.7869	-1.2237
Policy years. Subprime market expansion.	sp_2004_2006_cat_2	2004 ≤ X ≤ 2006	0.7117	0.5690	0.5170	-0.1562	0.9566	-1.3237
Policy years. Housing crisis.	df_2007_XXXX_cat_2	X ≥ 2007	0.6170	0.3087	0.8075	-0.7764	0.6279	-1.9253
Downpayment assistance and gift letter source.	gift_ltr_src_cat_1	None, Other						
	gift_ltr_src_cat_2	Relatives	0.3998	-0.0683	0.5152	0.0500	0.0689	-0.1241
	gift_ltr_src_cat_3	Non-Profit	0.8998	-0.0826	1.2930	-0.2402	-0.8254	0.3626
Judicial or non-judicial foreclosure state.	judicial_cat_2	Judicial	0.1270	-0.0402	-0.3693	-0.2080	-0.0378	-0.2312
FICO score categories.	fico_300_499	300 < X ≤ 499	1.3274	0.1272	1.7791	-0.3651	-0.0538	-0.3419
	fico_500_559	500 < X ≤ 559	0.9431	0.0484	0.9501	-0.2502	-0.0864	-0.2676
	fico_560_599	560 < X ≤ 599	0.3661	0.0349	0.2419	-0.1897	-0.0864	-0.1206
	fico_600_639	600 < X ≤ 639						
	fico_640_659	640 < X ≤ 659	-0.4572	-0.0263	0.5435		0.1398	0.2006
	fico_660_679	660 < X ≤ 679	-0.8505	-0.0542	-0.4255		0.1398	0.3916
	fico_680_719	680 < X ≤ 719	-1.4845	-0.0773	-1.0091		0.4346	0.4250
	fico_720_850	720 < X ≤ 850	-2.0612	-0.0310	-1.1817		0.4346	0.4250
Missing FICO indicators for loans originate 1992 and later and potentially available for scoring.	fico_000	No score generated on loan submitted for scoring by Unicon.	-0.5973	-0.0795	-0.7227	-0.1268	0.1736	0.3521
	fico_999	Loan not submitted for scoring or from time period without scores.	-0.8570	0.0306	-0.7289	-0.1568	1.0980	-0.7884
Loan was sampled from subset of FHA loans Unicon Corp submitted to credit repositories to obtain FICO information.	unicon_loan	Loan sampled from Unicon subsample.	-0.3454	0.0218	0.6060	-0.0638	0.9921	-0.2688
Mortgage age function.	age1	Age spline function knot values given in respective columns to the right next to the corresponding coefficient estimates.	4 0.2261	4 0.1987	4 0.3932	4 0.1942	4	4
Piece-wise linear spline for ages up to specified knot points (shown as the number of quarters since origination).	age2		8 0.0632	8 0.0669	8 -0.0803	8 0.0919	8	8
	age3		> 8 -0.0130	12 0.0132	> 8 -0.0615	20 0.0108	12	12
	age4			16 -0.1061		> 20 0.0106	16	16
Estimated coefficient gives the slope of the function for each linear segment.	age5			> 16 0.0137			20	20
	age6						>20	>20
Default duration function.	deftime1	Default duration spline function knot values given in respective columns to the right next to the corresponding coefficient estimates.				1 -0.1369	1	1 0.3227
Piece-wise linear spline for durations (quarters) up to specified knot points.	deftime2					2 -0.3116	2	2 0.2992
	deftime3					3 -0.2633	3	3 0.1882
Estimated coefficient gives the slope of the function for each linear segment.	deftime4					4 -0.4960	4	4 -0.2214
	deftime5					≥ 5 0.0000	≥ 5	≥ 5 0.0000
Intercept term.	constant	1	-6.6541	-5.2565	-10.5817	-1.3853	-3.8590	-1.6857
Estimation Sample Count	N	Total	1,087,675	1,120,186	1,079,239	22,639	20,089	20,476
- Log Likelihood (model)	L1		-46,142.03	-173,386.24	-1,237.04	-8,823.55	-2,976.39	-4,112.41
- Log Likelihood (constant)	L0		-50,059.71	-179,594.44	-1,366.13	-9,391.23	-3,182.19	-4,374.72
Degrees of Freedom	d.f.	L1 - L0 parameters	57	57	44	52	42	49
Chi-Squared Test Value	Chi-square	- 2*(L0-L1)	7,835	12,416	258	1,135	412	525

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**	**current_claim**	**default_cure**	**default_prepay**	**default_claim**
Relative house price measured as percentage of Census median house value during quarter of loan origination.	rel_hp_cat_1	0 < X ≤ 50						
	rel_hp_cat_2	50 < X ≤ 75	-0.1028	0.1486	0.0384	0.0140	-0.0979	-0.0676
	rel_hp_cat_3	75 < X ≤ 100	-0.2236	0.2561	-0.0249	0.0175	-0.1262	-0.1325
	rel_hp_cat_4	100< X ≤ 125	-0.2913	0.2828	0.0125	0.0213	-0.2770	-0.1311
	rel_hp_cat_5	125< X ≤ 150	-0.2912	0.2812	0.1915	-0.0480	-0.3221	-0.2039
	rel_hp_cat_6	X > 150	-0.2867	0.2375	-0.5273	-0.0890	-0.3599	-0.2022
Loan-to-value at origination.	ltvcat_cat_1	0 < X ≤ 80						
	ltvcat_cat_2	80 < X ≤ 90	0.0097	-0.0041	1.0178	-0.0271	-0.1825	0.4709
	ltvcat_cat_3	90 < X ≤ 95	0.1007	0.1093	1.5619	-0.0987	-0.1633	0.4808
	ltvcat_cat_4	95 < X < 97	0.1722	0.1809	1.4868	-0.1197	-0.2301	0.5773
	ltvcat_cat_5	97 ≤ X	0.1393	0.1172	1.4042	-0.0862	-0.2949	0.4901
Refinance loan.	refinance_cat_2	Refinance	-0.0633	0.0631	0.3791	0.0411	0.0343	0.2910
Season of event exposure in calendar quarter.	season_cat_1	X = 1						
	season_cat_2	X = 2	-0.0907	0.0515	-0.1571	-0.0555	0.0944	-0.0393
	season_cat_3	X = 3	0.1220	0.0194	0.0529	-0.1886	0.0476	-0.0461
	season_cat_4	X = 4	0.1217	-0.1043	0.1026	-0.2681	-0.1549	-0.0581
Probability of negative equity. Based on FHFA house price drift and volatility estimates.	pneqcat_cat_1	0.00 ≤ X ≤ 0.05						
	pneqcat_cat_2	0.05 < X ≤ 0.10	0.0436	-0.3046	0.4537	-0.1121	-1.0240	0.4078
	pneqcat_cat_3	0.10 < X ≤ 0.15	0.0514	-0.4824	0.6539	-0.1416	-1.4302	0.5237
	pneqcat_cat_4	0.15 < X ≤ 0.20	0.1760	-0.5753	0.8261	-0.2020	-1.4278	0.5474
	pneqcat_cat_5	0.20 < X ≤ 0.25	0.2736	-0.6623	1.0078	-0.2783	-2.1769	0.6700
	pneqcat_cat_6	0.25 < X ≤ 0.30	0.3544	-0.7751	1.2059	-0.3371	-2.3448	0.6966
	pneqcat_cat_7	X > 0.30	0.5864	-1.0454	1.7162	-0.6760	-3.0819	1.1041
Mortgage premium value measured as difference between current coupon rate and average FRM market rate, divided by current coupon rate.	spreadcat_cat_1	X ≤ -30						
	spreadcat_cat_2	-30 < X ≤ -20	0.1711	0.2016	-0.2638	0.0252	-0.0720	-0.0497
	spreadcat_cat_3	-20 < X ≤ -10	0.2494	0.3183	0.0984	0.0397	-0.1334	-0.0728
	spreadcat_cat_4	-10 < X ≤ 0	0.3223	0.5877	0.0567	-0.0347	-0.1536	-0.0729
	spreadcat_cat_5	0 < X ≤ 10	0.3617	0.9650	-0.0757	-0.0632	-0.1795	-0.0241
	spreadcat_cat_6	10 < X ≤ 20	0.4543	1.3037	-0.0065	-0.0266	0.0472	-0.1540
	spreadcat_cat_7	20 < X ≤ 30						
	spreadcat_cat_8	X > 30						
Yield curve slope measured as ratio of 10-year CMT to 1-year CMT rates.	ycslopecat_cat_1	0.0 ≤ X ≤ 1.0						
	ycslopecat_cat_2	1.0 < X ≤ 1.2	-0.0395	-0.2658	-0.3238	0.0432	-0.1649	0.0639
	ycslopecat_cat_3	1.2 < X ≤ 1.5	0.0988	-0.0854	-0.5311	0.0394	-0.0951	-0.1476
	ycslopecat_cat_4	X > 1.5	0.1293	-0.2912	-0.6059	-0.0079	-0.3534	-0.1106
Burnout factor equal to moving average number of basis points prepayment option was in the money during quarters in the money over preceding 8 quarters.	in_moneycat_cat_1	X ≤ 0						
	in_moneycat_cat_2	0 < X ≤ 50	0.1937	0.0018	0.2820	0.0489	0.0943	0.0716
	in_moneycat_cat_3	50 < X ≤ 100	0.5778	-0.0130	0.0957	-0.1020	0.4838	-0.5001
	in_moneycat_cat_4	100 < X ≤ 150	0.9152	0.1534	0.7410	-0.3090	0.8104	0.1514
	in_moneycat_cat_5	150 < X ≤ 200						
	in_moneycat_cat_6	X > 200						
Cohort years. FHA underwriting changes.	fy_1986_1992_cat_2	1986 ≤ X ≤ 1992	-0.5303	0.1012	0.6978	-0.1589	0.3191	0.4975
Cohort years. FHA underwriting changes.	fy_1993_1995_cat_2	1993 ≤ X ≤ 1995						
Cohort years. FHA underwriting changes.	fy_1996_XXXX_cat_2	X ≥ 1996	0.5451	0.2972	0.6885	-0.0967	-0.1220	-0.0877
Policy years. Loan modification tools.	lm_1996_2001_cat_2	1996 ≤ X ≤ 2001	0.4518	0.4941	-0.1701	-0.2866	0.1971	-0.1258
Policy years. Loan modification tools.	lm_2002_2003_cat_2	2002 ≤ X ≤ 2003	0.5346	0.5911	0.3971	-0.1352	0.6868	-0.0451
Policy years. Subprime market expansion.	sp_2004_2006_cat_2	2004 ≤ X ≤ 2006	0.7053	0.6617	0.4356	-0.0819	0.9647	-0.2358
Policy years. Housing crisis.	df_2007_XXXX_cat_2	X ≥ 2007	0.5018	-0.1110	0.5298	-0.6130	-0.0208	-0.3406

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

Variable			Status Transition (from_to)					
Description	**Name**	**Values**	**current_default**	**current_prepay**	**current_claim**	**default_cure**	**default_prepay**	**default_claim**
Downpayment assistance and gift letter source.	gift_ltr_src_cat_1	None Recorded						
	gift_ltr_src_cat_2	Relatives	0.2339	-0.0072	0.2575	-0.0539	-0.0004	0.0042
	gift_ltr_src_cat_3	Non-Profit	0.4270	-0.1779	0.6519	-0.0866	-0.3845	0.2831
	gift_ltr_src_cat_4	Government	0.4745	-0.2125	0.4604	-0.2760	-0.4006	0.3420
	gift_ltr_src_cat_5	Other	0.8972	0.0974		0.1130	-0.0520	-0.4309
Judicial or non-judicial foreclosure state.	judicial_cat_2	Judicial	0.0677	-0.1823	-0.2324	-0.1575	-0.3067	-0.2919
FICO score categories.	fico_300_499	300 < X ≤ 499	1.2538	-0.3820	0.8778	-0.3680	-0.4642	-0.3931
	fico_500_559	500 < X ≤ 559	0.7169	-0.1250	0.5376	-0.0686	-0.2805	-0.2854
	fico_560_599	560 < X ≤ 599	0.3282	-0.0595	0.1586	-0.0381	-0.2450	-0.1906
	fico_600_639	600 < X ≤ 639						
	fico_640_659	640 < X ≤ 659	-0.3876	0.0833	-0.2691	-0.0166	0.0304	0.1170
	fico_660_679	660 < X ≤ 679	-0.7055	0.1046	-0.3610	-0.0164	0.3939	0.1796
	fico_680_719	680 < X ≤ 719	-1.1067	0.2120	-1.0112	0.0359	0.2741	0.2127
	fico_720_850	720 < X ≤ 850	-1.7356	0.2530	-1.2323	0.0912	0.3227	0.1643
Missing FICO indicators for loans originate 1992 and later and potentially available for scoring.	fico_000	No score generated on loan submitted for scoring by Unicon.	-0.0915	0.0385	-0.0120	-0.1352	0.1292	0.0792
	fico_999	Loan not submitted for scoring or from time period without scores.	-0.3636	0.1469	0.0349	-0.1699	0.2443	0.0206
Loan was sampled from subset of FHA loans Unicon Corp submitted to credit repositories to obtain FICO information.	unicon_loan	Loan sampled from Unicon subsample.	0.1935	-0.0024	1.3161	-0.3739	0.0347	0.6322
Average market mortgage rate during current policy year.	ey_ratecat_cat_1	X ≤ 6						
	ey_ratecat_cat_2	6 < X ≤ 7	0.0337	-0.1246	-0.0817	0.0889	0.0218	-0.0480
	ey_ratecat_cat_3	7 < X ≤ 8	-0.0101	-0.4217	-0.2586	-0.0024	0.0119	-0.1130
	ey_ratecat_cat_4	8 < X ≤ 9	-0.0210	-0.7698	-0.3760	0.0634	-0.0162	-0.1699
	ey_ratecat_cat_5	9 < X ≤ 10	0.0634	-1.0111	-0.5864	0.0131	0.1104	-0.3503
	ey_ratecat_cat_6	X > 10						
Mortgage age function. Piece-wise linear spline for ages up to specified knot points (shown as the number of quarters since origination). Estimated coefficient gives the slope of the function for each linear segment.	age1	Age spline function knot values given in respective columns to the right next to the corresponding coefficient estimates.	2 0.7569	2 0.6179	2 0.4706	4 0.1703	4 0.4421	4 0.2048
	age2		4 0.1800	4 0.3047	4 0.4972	8 0.0655	8 -0.0146	8 0.0752
	age3		8 0.0897	8 0.0280	8 0.1929	12 0.0075	12 0.0294	12 0.0283
	age4		12 0.0477	12 -0.0149	12 0.0931	16 0.0076	16 -0.0112	16 -0.0151
	age5		36 0.0032	16 -0.0695	36 -0.0178	20 0.0147	20 0.0173	20 -0.0178
	age6		> 36 -0.0119	> 16 -0.0120	> 36 -0.0439	> 20 0.0031	> 20 -0.0032	> 20 -0.0339
Default duration function. Piece-wise linear spline for durations (quarters) up to specified knot points. Estimated coefficient gives the slope of the function for each linear segment.	deftime1	Default duration spline function knot values given in respective columns to the right next to the corresponding coefficient estimates.				1 -0.1588	1 -0.1814	1 0.7829
	deftime2					2 -0.3816	2 -0.1222	2 0.2632
	deftime3					3 -0.2360	3 -0.0371	3 0.0406
	deftime4					4 -0.5195	4 -0.1717	4 -0.1758
	deftime5					≥ 5 0.0000	≥ 5 0.0000	≥ 5 0.0000
Intercept term.	constant	1	-7.1390	-5.3104	-12.5908	-1.6872	-4.4385	-4.7472
Estimation Sample Count	N	Total	3,875,826	4,015,082	3,803,094	236,648	215,474	227,321
- Log Likelihood (model)	L1		-348,950.08	-783,832.59	-13,860.31	-80,742.49	-26,082.39	-58,958.90
- Log Likelihood (constant)	L0		-367,969.76	-834,748.43	-14,919.54	-84,828.04	-28,207.81	-63,099.45
Degrees of Freedom	d.f.	L1 - L0 parameters	62	62	61	66	66	66
Chi-Squared Test Value	Chi-square	- 2*(L0-L1)	38,039	101,832	2,118	8,171	4,251	8,281

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**	**current_claim**	**default_cure**	**default_prepay**	**default_claim**
Loan product type of prior FHA fully-underwritten mortgage for streamline refinance mortgage.	repeat_refi_type_cat_1	1						
	repeat_refi_type_cat_2	2	0.1307	0.0980	0.5704	-0.1205	-0.3581	0.2113
	repeat_refi_type_cat_3	3	-0.0594	0.0468	0.2901	-0.1654	0.1366	-0.0160
	repeat_refi_type_cat_4	4	-0.0891	0.3451	0.0045	0.0410	0.2195	0.1134
	repeat_refi_type_cat_5	5	-0.0404	0.1964		0.1945	0.5560	-0.3319
	repeat_refi_type_cat_6	6	0.0503	0.2777	0.4055	0.0214	0.2839	0.2678
Relative loan size measured as the percentage of average size loan originated in the same state in the same year.	loancat_cat_1	0 < X ≤ 60						
	loancat_cat_2	60 < X ≤ 90	0.1736	0.3823	0.1854	-0.0220	0.1629	-0.2448
	loancat_cat_3	90 < X ≤ 110	0.2472	0.6353	0.2763	-0.0113	0.3203	-0.3243
	loancat_cat_4	110 < X ≤ 140	0.2990	0.8092	0.3234	-0.0359	0.3563	-0.3472
	loancat_cat_5	X > 140	0.3361	0.9255	0.4049	0.0298	0.5563	-0.4612
Season of event exposure in calendar quarter.	season_cat_1	X = 1						
	season_cat_2	X = 2	-0.0147	0.1784	-0.1774	-0.1657	0.1620	-0.0420
	season_cat_3	X = 3	0.1519	0.1359	-0.0069	-0.2476	0.1153	-0.0549
	season_cat_4	X = 4	0.1806	0.1045	0.3081	0.6177	0.1649	0.0699
Probability of negative equity. Based on FHFA house price drift and volatility estimates.	pneqcat_cat_1	0.00 ≤ X ≤ 0.05						
	pneqcat_cat_2	0.05 < X ≤ 0.10	0.2773	-0.3489	0.8412	-0.0775	-1.1719	0.6096
	pneqcat_cat_3	0.10 < X ≤ 0.15	0.3571	-0.4506	1.2043	-0.1046	-1.6940	0.8552
	pneqcat_cat_4	0.15 < X ≤ 0.20	0.3759	-0.5495	1.4354	-0.1716	-1.8596	0.8941
	pneqcat_cat_5	0.20 < X ≤ 0.25	0.4628	-0.6306	1.6655	-0.2013	-2.2058	1.0075
	pneqcat_cat_6	0.25 < X ≤ 0.30	0.5270	-0.7482	1.8096	-0.1687	-2.0394	1.0662
	pneqcat_cat_7	X > 0.30	0.8539	-0.7991	2.2305	-0.2328	-2.0788	1.2888
Mortgage premium value measured as difference between current coupon rate and average FRM market rate, divided by current coupon rate.	spreadcat_cat_1	X ≤ -30						
	spreadcat_cat_2	-30 < X ≤ -20						
	spreadcat_cat_3	-20 < X ≤ -10						
	spreadcat_cat_4	-10 < X ≤ 0	0.0925	0.1170	0.2570	-0.2603	-0.0864	-0.0687
	spreadcat_cat_5	0 < X ≤ 10	0.2255	0.3865	0.5381	-0.4080	-0.0325	-0.0666
	spreadcat_cat_6	10 < X ≤ 20	0.4155	0.9008	0.5574	-0.0832	0.0668	-0.0577
	spreadcat_cat_7	20 < X ≤ 30	0.5244	1.0781	0.4066	0.0849	0.0754	-0.0278
	spreadcat_cat_8	X > 30	0.6547	1.0052	0.9146	0.3220	0.1072	-0.0514
Yield curve slope measured as ratio of 10-year CMT to 1-year CMT rates.	ycslopecat_cat_1	0.0 ≤ X ≤ 1.0						
	ycslopecat_cat_2	1.0 < X ≤ 1.2	0.0420	-0.1125	-0.7900	-0.0427	-0.2774	0.0497
	ycslopecat_cat_3	1.2 < X ≤ 1.5	0.0138	0.0143	-0.4404	0.5086	-0.2288	0.2190
	ycslopecat_cat_4	X > 1.5	0.0541	0.1421	-0.9439	0.2195	-0.4071	0.1412
Burnout factor equal to moving average number of basis points prepayment option was in the money during quarters in the money over preceding 8 quarters.	in_moneycat_cat_1	X ≤ 0						
	in_moneycat_cat_2	0 < X ≤ 50	0.0777	0.1241	0.1037	0.3217	0.0455	-0.0547
	in_moneycat_cat_3	50 < X ≤ 100	0.2726	0.3894	0.5642	0.2386	0.1552	-0.0607
	in_moneycat_cat_4	100 < X ≤ 150	0.4507	0.4999	0.9080	-0.0045	0.2039	-0.0947
	in_moneycat_cat_5	150 < X ≤ 200	0.6184	0.4878	1.0950	-0.1251	0.2072	-0.2596
	in_moneycat_cat_6	X > 200	0.7147	0.4412	0.4656	-0.2867	0.3165	-0.4135
Cohort years. FHA underwriting changes.	fy_1986_1992_cat_2	1986 ≤ X < 1992	-0.0407	-0.0364	1.7958	-0.9485	-0.3069	0.1369
Cohort years. FHA underwriting changes.	fy_1993_1995_cat_2	1993 ≤ X ≤ 1995						
Cohort years. FHA underwriting changes.	fy_1996_XXXX_cat_2	X ≥ 1996	0.4518	0.1798	-0.4476	0.3939	-0.0313	-0.3061
Policy years. Loan modification tools.	lm_1996_2001_cat_2	1996 ≤ X < 2001	0.5317	0.3199	0.5759	-0.4703	-0.0553	-0.2950
Policy years. Loan modification tools.	lm_2002_2003_cat_2	2002 ≤ X ≤ 2003	0.8714	0.9439	1.0530	-0.8812	0.3504	-0.4789
Policy years. Subprime market expansion.	sp_2004_2006_cat_2	2004 ≤ X ≤ 2006	1.1729	0.6269	1.3146	-0.6139	0.4115	-0.2031
Policy years. Housing crisis.	df_2007_XXXX_cat_2	X ≥ 2007	1.2740	-0.0680	2.8707	-0.7377	-0.5504	-0.7822

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**	**current_claim**	**default_cure**	**default_prepay**	**default_claim**
Average market mortgage rate during current policy year.	ey_ratecat_cat_1	X ≤ 6						
	ey_ratecat_cat_2	6 < X ≤ 7						
	ey_ratecat_cat_3	7 < X ≤ 8						
	ey_ratecat_cat_4	8 < X ≤ 9						
	ey_ratecat_cat_5	9 < X ≤ 10						
	ey_ratecat_cat_6	X > 10						
Downpayment assistance and gift letter source.	gift_ltr_src_cat_1	None Recorded						
	gift_ltr_src_cat_2	Relatives	0.2497	0.0800	0.1911	0.0110	0.0825	-0.0560
	gift_ltr_src_cat_3	Non-Profit	0.4638	0.0856	0.2818	-0.0597	-0.1717	0.2589
	gift_ltr_src_cat_4	Government	0.3793	-0.0088	0.4672	-0.0244	-0.1406	0.2619
	gift_ltr_src_cat_5	Other	-0.3999	0.4666	0.1848	0.1335	0.7027	-0.3886
Judicial or non-judicial foreclosure state.	judicial_cat_2	Judicial	0.0319	-0.1697	-0.0250	-0.1107	-0.2095	-0.3856
Appraisal required on streamline refinance.	appraisal_req_cat_2	Appraisal Required	-0.0020	-0.1600	-0.1333	-0.0315	-0.0007	-0.2008
FICO score categories.	fico_300_499	300 < X ≤ 499	1.0463	-0.1356	0.6407	0.0515	-0.1626	-0.5875
	fico_500_559	500 < X ≤ 559	0.6904	-0.1210	0.5350	0.0813	-0.1785	-0.4353
	fico_560_599	560 < X ≤ 599	0.3380	-0.0474	0.0859	0.0622	-0.0381	-0.2402
	fico_600_639	600 < X ≤ 639						
	fico_640_659	640 < X ≤ 659	-0.2830	0.0127	-0.1590	0.0364	0.0229	0.2005
	fico_660_679	660 < X ≤ 679	-0.6961	0.0189	-0.2249	-0.0706	0.1715	0.2963
	fico_680_719	680 < X ≤ 719	-1.0632	0.0488	-0.6281	-0.0521	0.1210	0.3084
	fico_720_850	720 < X ≤ 850	-1.6883	0.0725	-1.1182	-0.1003	0.4734	0.3611
Missing FICO indicators for loans originate 1992 and later and potentially available for scoring.	fico_000	No score generated on loan submitted for scoring by Unicon.	0.0143	-0.5466	0.1222	-0.1238	-0.1986	-0.0651
	fico_999	Loan not submitted for scoring or from time period without scores.	-0.3823	-0.5386	0.8175	-0.6304	0.1095	-0.0745
Loan was sampled from subset of FHA loans Unicon Corp submitted to credit repositories to obtain FICO information.	unicon_loan	Loan sampled from Unicon subsample.	-0.0812	-0.6448	1.5233	-0.7691	-0.0055	0.4798
Mortgage age function.	age1	Age spline function knot values given in respective columns to the right next to the corresponding coefficient estimates.	2 0.5808	2 0.6037	2 1.5461	4 0.1782	4 -0.0278	4 0.2563
Piece-wise linear spline for ages up to specified knot points (shown as the number of quarters since origination).	age2		4 0.1712	4 0.0867	4 0.4422	8 0.0789	8 0.0154	8 0.0472
	age3		8 0.0571	8 -0.0075	8 0.1229	12 -0.0166	12 0.0189	12 -0.0125
	age4		12 0.0092	12 -0.0401	12 -0.0115	16 0.0082	16 -0.0377	16 0.0091
Estimated coefficient gives the slope of the function for each linear segment.	age5		36 -0.0126	36 -0.0171	36 -0.0414	20 0.0711	20 0.0261	20 0.0080
	age6		>36 -0.0405	> 36 -0.0283	>36 -0.0813	> 20 0.0182	> 20 -0.0050	> 20 -0.0275
Default duration function.	deftime1	Default duration spline function knot values given in respective columns to the right next to the corresponding coefficient estimates.				1 -0.0711	1 -0.0892	1 1.0933
Piece-wise linear spline for durations (quarters) up to specified knot points.	deftime2					2 -0.2133	2 -0.2006	2 0.5495
	deftime3					3 -0.1661	3 -0.1862	3 0.2026
Estimated coefficient gives the slope of the function for each linear segment.	deftime4					4 -0.4769	4 -0.0501	4 -0.2785
	deftime5					≥ 5 0.0000	≥ 5 0.0000	≥ 5 0.0000
Intercept term.	constant	1	-7.8324	-5.4331	-15.8768	-1.6772	-2.8750	-4.3454
Estimation Sample Count	N	Total	7,140,306	7,413,420	7,056,437	248,138	217,016	225,405
- Log Likelihood (model)	L1		-432712.19	-1322148.5	-10479.344	-101786.75	-30616.502	-52423.935
- Log Likelihood (constant)	L0		-471231.76	-1476643.5	-11818.651	-109564.03	-33998.171	-59443.786
Degrees of Freedom	d.f.	L1 - L0 parameters	60	60	59	64	64	64
Chi-Squared Test Value	Chi-square	- 2*(L0-L1)	77,039	308,990	2,679	15,555	6,763	14,040

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_default**	**current_prepay**	**current_claim**	**default_cure**	**default_prepay**	**default_claim**
Loan product type of prior FHA fully-underwritten mortgage for streamline refinance mortgage.	repeat_refi_type_cat_1	1						
	repeat_refi_type_cat_2	2	-0.0925	0.2731	0.6988	-0.1544	0.0243	0.0917
	repeat_refi_type_cat_3	3	-0.2682	0.2785	-0.4076	-0.2087	0.5468	0.4161
	repeat_refi_type_cat_4	4	-0.3854	0.2323	-0.3577	-0.0800	0.2588	0.3641
	repeat_refi_type_cat_5	5	-0.1508	0.3459	0.5116	-0.1433	0.1282	0.3187
	repeat_refi_type_cat_6	6	-0.4055	0.4189		-0.0693		
Relative loan size measured as the percentage of average size loan originated in the same state in the same year.	loancat_cat_1	0 < X ≤ 60						
	loancat_cat_2	60 < X ≤ 90	0.0990	0.0827	-0.3068	0.0088	0.0630	-0.3071
	loancat_cat_3	90 < X ≤ 110	0.1025	0.1590	-0.5598	-0.0085	0.2180	-0.5365
	loancat_cat_4	110 < X ≤ 140	0.0969	0.2367	-0.5767	0.0170	0.1868	-0.6252
	loancat_cat_5	X > 140	0.1539	0.3650	-0.1790	-0.1187	0.1220	-0.4652
Season of event exposure in calendar quarter.	season_cat_1	X = 1						
	season_cat_2	X = 2	-0.0630	0.0111	-0.1848	-0.0730	-0.1255	-0.0499
	season_cat_3	X = 3	0.0589	-0.0447	-0.0931	-0.1526	-0.0527	-0.0775
	season_cat_4	X = 4	0.1350	-0.1302	0.1519	-0.3029	-0.1792	0.0457
Probability of negative equity. Based on FHFA house price drift and volatility estimates.	pneqcat_cat_1	0.00 ≤ X ≤ 0.05						
	pneqcat_cat_2	0.05 < X ≤ 0.10	0.2438	-0.3097	1.1905	-0.3897	-1.4204	0.8313
	pneqcat_cat_3	0.10 < X ≤ 0.15	0.2898	-0.4344	1.1905	-0.3897	-1.4204	0.6487
	pneqcat_cat_4	0.15 < X ≤ 0.20	0.4709	-0.5548	1.1214	-0.6512	-1.9207	0.8047
	pneqcat_cat_5	0.20 < X ≤ 0.25	0.5369	-0.6674	1.6914	-0.6512	-1.9207	0.9346
	pneqcat_cat_6	0.25 < X ≤ 0.30	0.6036	-0.7286	1.8392	-0.6512	-1.9207	1.1210
	pneqcat_cat_7	X > 0.30	0.5898	-0.7896	2.0517	-0.6512	-1.9207	1.2740
Mortgage premium value measured as difference between current coupon rate and average FRM market rate, divided by current coupon rate.	spreadcat_cat_1	X ≤ -30						
	spreadcat_cat_2	-30 < X ≤ -20	0.0979	0.1105	0.3623			
	spreadcat_cat_3	-20 < X ≤ -10	0.1890	0.2793	0.6953			
	spreadcat_cat_4	-10 < X ≤ 0	0.3337	0.4116	0.9106	-0.0148	-0.2115	-0.0327
	spreadcat_cat_5	0 < X ≤ 10	0.4243	0.6172	1.0384	-0.0530	-0.1935	-0.0355
	spreadcat_cat_6	10 < X ≤ 20	0.5866	0.8987	1.2431	-0.1674	-0.3270	-0.0528
	spreadcat_cat_7	20 < X ≤ 30	0.6711	1.1129	1.2431	-0.2061	-0.3187	-0.2143
	spreadcat_cat_8	X > 30	0.7941	1.1831	1.2431	-0.1968	-0.3187	-0.2143
Yield curve slope measured as ratio of 10-year CMT to 1-year CMT rates.	ycslopecat_cat_1	0.0 ≤ X ≤ 1.0						
	ycslopecat_cat_2	1.0 < X ≤ 1.2	0.0296	-0.0040	0.1062	-0.1375	-0.0738	-0.0321
	ycslopecat_cat_3	1.2 < X ≤ 1.5	-0.0725	0.0542	0.3607	-0.0097	0.0933	0.0095
	ycslopecat_cat_4	X > 1.5	0.0061	0.3035	-0.3171	-0.1330	0.0240	0.1613
Burnout factor equal to moving average number of basis points prepayment option was in the money during quarters in the money over preceding 8 quarters.	in_moneycat_cat_1	X ≤ 0						
	in_moneycat_cat_2	0 < X ≤ 50	0.0749	0.1129	0.5424	-0.0288	0.1816	0.2004
	in_moneycat_cat_3	50 < X ≤ 100	0.2517	0.0765	0.6977	0.0026	0.3155	0.1484
	in_moneycat_cat_4	100 < X ≤ 150	0.4300	-0.0653	1.2349	-0.0111	0.2456	0.2259
	in_moneycat_cat_5	150 < X ≤ 200	0.5256	-0.3054	0.8007	0.0298	0.2974	0.3264
	in_moneycat_cat_6	X > 200	0.6695	-0.4471	0.9848	-0.0055	0.0607	0.1788
Cohort years. FHA underwriting changes.	fy_1975_1986_cat_2	1975 ≤ X < 1986						
Cohort years. FHA underwriting changes.	fy_1986_1992_cat_2	1986 ≤ X < 1992						
Cohort years. FHA underwriting changes.	fy_1993_1995_cat_2	1993 ≤ X ≤ 1995						
Cohort years. FHA underwriting changes.	fy_1996_XXXX_cat_2	X ≥ 1996	0.2024	0.0964	-0.5008	-0.0410	-0.0397	-0.5118
Policy years. Loan modification tools.	lm_1996_2001_cat_2	1996 ≤ X < 2001	0.7580	0.2178	-0.1626	-0.2515	-0.1552	-0.3139
Policy years. Loan modification tools.	lm_2002_2003_cat_2	2002 ≤ X ≤ 2003	0.8931	0.3612	-0.2226	-0.1021	-0.2002	-0.6873
Policy years. Subprime market expansion.	sp_2004_2006_cat_2	2004 ≤ X ≤ 2006	1.0985	0.0596	-0.0579	-0.0154	-0.2248	-0.7159
Policy years. Housing crisis.	df_2007_XXXX_cat_2	X ≥ 2007	1.2254	-0.3134	0.9122	-0.5608	-0.7639	-0.9148

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

Variable			Status Transition (from_to)					
Description	**Name**	**Values**	**current_default**	**current_prepay**	**current_claim**	**default_cure**	**default_prepay**	**default_claim**
Downpayment assistance and gift letter source.	gift_ltr_src_cat_1	None Recorded						
	gift_ltr_src_cat_2	Relatives	0.4523	0.3432	1.3063	-0.0968	0.1629	0.2329
	gift_ltr_src_cat_3	Non-Profit	0.8064	0.3700	2.4835	-0.2955	-1.0588	1.1594
	gift_ltr_src_cat_4	Government	0.9098	0.2845	1.9440	-0.5387	-0.0711	1.2480
	gift_ltr_src_cat_5	Other	-0.0680	0.0516	(dropped)	-0.0294	0.8550	0.6667
Judicial or non-judicial foreclosure state.	judicial_cat_2	Judicial	0.2209	-0.0748	-0.0513	-0.2009	-0.0690	-0.0473
Appraisal required on streamline refinance.	appraisal_req_cat_2	Appraisal Required	0.0450	-0.0380	0.1171	-0.0724	-0.1966	0.2705
FICO score categories.	fico_300_499	300 < X ≤ 499	1.2090	-0.1432	1.0400	-0.0301	-0.2978	-0.8530
	fico_500_559	500 < X ≤ 559	0.8758	-0.0951	0.1517	0.0189	-0.2148	-0.4435
	fico_560_599	560 < X ≤ 599	0.4311	-0.0518	-0.1807	0.0625	-0.1838	-0.2326
	fico_600_639	600 < X ≤ 639						
	fico_640_659	640 < X ≤ 659	-0.5559	-0.0951	-0.8443	-0.0784	-0.0171	0.1995
	fico_660_679	660 < X ≤ 679	-0.7726	-0.0868	-0.9093	-0.0394	0.0499	0.3768
	fico_680_719	680 < X ≤ 719	-1.2765	-0.1127	-1.5569	-0.0394	0.0499	0.6219
	fico_720_850	720 < X ≤ 850	-2.3706	-0.1470	-1.7682	-0.0394	0.0499	0.6219
Missing FICO indicators for loans originate 1992 and later and potentially available for scoring.	fico_000	No score generated on loan submitted for scoring by Unicon.	-0.1412	-0.3181	-0.7136	0.0632	0.2268	0.4162
	fico_999	Loan not submitted for scoring or from time period without scores.	-0.4936	-0.1440	-0.4762	-0.0287	0.2595	-0.1507
Loan was sampled from subset of FHA loans Unicon Corp submitted to credit repositories to obtain FICO information.	unicon_loan	Loan sampled from Unicon subsample.	0.0176	-0.1015	0.8519	-0.0274	0.3245	0.1758
Mortgage age function.	age1	Age spline function knot values given in respective columns to the right next to the corresponding coefficient estimates.	2 0.4009	2 0.3433	2 -0.0542		4 0.2026	4 0.1585
Piece-wise linear spline for ages up to specified knot points (shown as the number of quarters since origination).	age2		4 0.1500	4 0.2013	4 0.4657		8 0.0003	8 0.0750
	age3		8 0.0565	8 0.0164	8 0.0137		12 0.0292	12 -0.0028
	age4		12 -0.0020	12 0.0288	12 0.0296		16 0.0357	16 -0.0308
Estimated coefficient gives the slope of the function for each linear segment.	age5		36 -0.0146	36 -0.0106	36 -0.0803		20 -0.1144	20 -0.0529
	age6		>36 -0.0430	> 36 0.1029	>36 -0.0393		> 20 0.0565	> 20 -0.0539
Default duration function.	deftime1	Default duration spline function knot values given in respective columns to the right next to the corresponding coefficient estimates.				1 -0.1285	1 -0.1818	1 0.6401
Piece-wise linear spline for durations (quarters) up to specified knot points.	deftime2					2 -0.3512	2 -0.1600	2 0.1469
	deftime3					3 -0.2842	3 0.0122	3 0.0792
Estimated coefficient gives the slope of the function for each linear segment.	deftime4					4 -0.4139	4 -0.3269	4 -0.0642
	deftime5					≥ 5 0.0000	≥ 5 0.0000	≥ 5 0.0000
Intercept term.	constant	1	-7.8560	-5.4736	-11.3707	-0.3838	-3.6734	-3.4678
Estimation Sample Count	N	Total	4,954,449	5,103,925	4,933,708	55,436	48,720	47,752
- Log Likelihood (model)	L1		-129,324.95	-713,004.06	-2,271.77	-23,939.52	-8,583.48	-6,801.59
- Log Likelihood (constant)	L0		-135,697.56	-748,123.63	-2,414.24	-25,266.81	-9,048.22	-7,375.89
Degrees of Freedom	d.f.	L1 - L0 parameters	61	61	56	51	55	60
Chi-Squared Test Value	Chi-square	- 2*(L0-L1)	12,745	70,239	285	2,655	929	1,149

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**	**current_claim**	**default_cure**	**default_prepay**	**default_claim**
Loan product type of prior FHA fully-underwritten mortgage for streamline refinance mortgage.	repeat_refi_type_cat_1	1						
	repeat_refi_type_cat_2	2	0.1414	0.0682	(dropped)	0.1195	-0.2999	-0.4301
	repeat_refi_type_cat_3	3	0.0056	0.2295	-0.0958	-0.0480	0.0710	-0.1393
	repeat_refi_type_cat_4	4	0.1449	0.2127	0.1810	-0.0095	-0.0211	0.0726
	repeat_refi_type_cat_5	5	-0.4429	-0.0205				
	repeat_refi_type_cat_6	6	0.1715	0.4727	0.1940	0.0117	0.2547	-0.0030
Relative loan size measured as the percentage of average size loan originated in the same state in the same year.	loancat_cat_1	0 < X ≤ 60						
	loancat_cat_2	60 < X ≤ 90	0.0924	0.3044	0.2248	-0.0309	-0.0234	-0.0948
	loancat_cat_3	90 < X ≤ 110	0.1749	0.4863	0.3514	-0.0284	0.2622	-0.1831
	loancat_cat_4	110 < X ≤ 140	0.1833	0.6090	0.3446	0.0120	0.3150	-0.3302
	loancat_cat_5	X > 140	0.2961	0.7501	0.3800	-0.1103	0.1444	-0.3038
Season of event exposure in calendar quarter.	season_cat_1	X = 1						
	season_cat_2	X = 2	-0.0896	0.0502	-0.2801	-0.1084	0.0191	-0.0451
	season_cat_3	X = 3	0.1031	-0.0846	0.0210	-0.1525	-0.0697	-0.1771
	season_cat_4	X = 4	0.0986	-0.1347	0.0732	-0.3452	-0.1425	-0.1951
Probability of negative equity. Based on FHFA house price drift and volatility estimates.	pneqcat_cat_1	0.00 ≤ X ≤ 0.05						
	pneqcat_cat_2	0.05 < X ≤ 0.10	0.2194	-0.3541	0.8600	-0.1549	-1.1272	0.6016
	pneqcat_cat_3	0.10 < X ≤ 0.15	0.3344	-0.4579	1.3554	-0.3090	-1.6137	0.8379
	pneqcat_cat_4	0.15 < X ≤ 0.20	0.4622	-0.4633	1.5204	-0.3196	-1.9826	0.8495
	pneqcat_cat_5	0.20 < X ≤ 0.25	0.4731	-0.4950	1.5582	-0.3319	-2.4029	1.0047
	pneqcat_cat_6	0.25 < X ≤ 0.30	0.5852	-0.5275	1.7892	-0.4468	-2.1158	1.0593
	pneqcat_cat_7	X > 0.30	1.0434	-0.9649	2.1906	-1.1475	-2.4950	1.1746
Mortgage premium value measured as difference between current coupon rate and average FRM market rate, divided by current coupon rate.	spreadcat_cat_1	X ≤ -30						
	spreadcat_cat_2	-30 < X ≤ -20	0.1640	0.0992	-0.0965	0.1456	-0.2029	0.0774
	spreadcat_cat_3	-20 < X ≤ -10	0.2040	0.2401	0.2823	0.1639	-0.3198	0.0957
	spreadcat_cat_4	-10 < X ≤ 0	0.2905	0.4464	0.2259	0.2242	-0.1479	0.0861
	spreadcat_cat_5	0 < X ≤ 10	0.2616	0.7113	0.0587	0.2916	-0.0472	0.1479
	spreadcat_cat_6	10 < X ≤ 20	0.3362	0.9452	0.4180	0.3309	0.2010	-0.0707
	spreadcat_cat_7	20 < X ≤ 30	0.3362	0.9452	0.4180	0.3309	0.2010	-0.0707
	spreadcat_cat_8	X > 30	0.3362	0.9452	0.4180	0.3309	0.2010	-0.0707
Yield curve slope measured as ratio of 10-year CMT to 1-year CMT rates.	ycslopecat_cat_1	0.0 ≤ X ≤ 1.0						
	ycslopecat_cat_2	1.0 < X ≤ 1.2	0.0835	-0.0975	-0.5460	0.0604	-0.0953	0.1425
	ycslopecat_cat_3	1.2 < X ≤ 1.5	0.2002	-0.0353	-0.3328	0.1309	-0.2385	0.0824
	ycslopecat_cat_4	X > 1.5	0.1749	-0.2599	-0.5151	0.0786	-0.5381	0.0730
Burnout factor equal to moving average number of basis points prepayment option was in the money during quarters in the money over preceding 8 quarters.	in_moneycat_cat_1	X ≤ 0						
	in_moneycat_cat_2	0 < X ≤ 50	0.0760	-0.1686	0.1825	0.0330	0.1453	-0.0003
	in_moneycat_cat_3	50 < X ≤ 100	0.0830	-0.4898	-0.6059	-0.0804	-0.1356	0.0897
	in_moneycat_cat_4	100 < X ≤ 150	0.0830	-0.4898	-0.6059	-0.0804	-0.1356	0.0897
	in_moneycat_cat_5	150 < X ≤ 200	0.0830	-0.4898	-0.6059	-0.0804	-0.1356	0.0897
	in_moneycat_cat_6	X > 200	0.0830	-0.4898	-0.6059	-0.0804	-0.1356	0.0897
Cohort years. FHA underwriting changes.	fy_1975_1986_cat_2	1975 ≤ X < 1986						
Cohort years. FHA underwriting changes.	fy_1986_1992_cat_2	1986 ≤ X < 1992	-0.5484	0.1134			0.4843	0.8779
Cohort years. FHA underwriting changes.	fy_1993_1995_cat_2	1993 ≤ X ≤ 1995						
Cohort years. FHA underwriting changes.	fy_1996_XXXX_cat_2	X ≥ 1996	0.9025	0.5611	-0.1135	-0.0643	0.0780	-0.4881
Policy years. Loan modification tools.	lm_1996_2001_cat_2	1996 ≤ X < 2001	0.4171	0.2091	0.3796	-0.2681	-0.4036	0.0932
Policy years. Loan modification tools.	lm_2002_2003_cat_2	2002 ≤ X ≤ 2003	0.6531	0.2514	0.6415	-0.0773	0.1648	0.1190
Policy years. Subprime market expansion.	sp_2004_2006_cat_2	2004 ≤ X ≤ 2006	0.8106	0.0454	1.3251	0.2421	0.3828	0.2622
Policy years. Housing crisis.	df_2007_XXXX_cat_2	X ≥ 2007	0.7114	-0.6150	1.3465	-0.5025	-0.8712	0.1023

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**	**current_claim**	**default_cure**	**default_prepay**	**default_claim**
Average market mortgage rate during current policy year.	ey_ratecat_cat_1	X ≤ 6						
	ey_ratecat_cat_2	6 < X ≤ 7	0.0637	-0.1094	0.0563	0.1881	0.0945	0.0723
	ey_ratecat_cat_3	7 < X ≤ 8	-0.0009	-0.5336	-0.3138	0.3548	0.0090	0.1298
	ey_ratecat_cat_4	8 < X ≤ 9	-0.0343	-0.8636	-0.4187	0.4387	0.1590	0.0846
	ey_ratecat_cat_5	9 < X ≤ 10	-0.0343	-0.8636	-0.4187	0.4387	0.1590	0.0846
	ey_ratecat_cat_6	X > 10	-0.0343	-0.8636	-0.4187	0.4387	0.1590	0.0846
Downpayment assistance and gift letter source.	gift_ltr_src_cat_1	None Recorded						
	gift_ltr_src_cat_2	Relatives	0.2288	0.0771	0.0545	0.0243	0.1285	-0.1156
	gift_ltr_src_cat_3	Non-Profit	0.4013	-0.0486	0.5655	-0.2259	-0.3351	0.1531
	gift_ltr_src_cat_4	Government	0.3022	0.0384	0.1187	0.1327	0.0177	0.5761
	gift_ltr_src_cat_5	Other	-0.0056	0.1191				0.0918
Judicial or non-judicial foreclosure state.	judicial_cat_2	Judicial	0.0393	-0.1076	-0.4046	-0.1686	-0.1526	-0.4498
Appraisal required on streamline refinance.	appraisal_req_cat_2	Appraisal Required	0.2451	-0.2588	0.0993	-0.0177	-0.2962	-0.0501
FICO score categories.	fico_300_499	300 < X ≤ 499	1.0442	-0.1924	0.1736	-0.2238	-0.0206	-0.6829
	fico_500_559	500 < X ≤ 559	0.5841	-0.1423	0.2286	-0.0537	0.1092	-0.3384
	fico_560_599	560 < X ≤ 599	0.3519	-0.0757	0.2208	-0.0750	-0.1488	-0.1267
	fico_600_639	600 < X ≤ 639						
	fico_640_659	640 < X ≤ 659	-0.3482	-0.0229	-0.1826	-0.0599	-0.0073	0.1171
	fico_660_679	660 < X ≤ 679	-0.5476	0.0416	-0.1784	-0.1821	0.2044	0.2668
	fico_680_719	680 < X ≤ 719	-1.0127	0.0693	-0.3026	-0.3548	0.3469	0.6067
	fico_720_850	720 < X ≤ 850	-1.7900	0.1201	-0.8575	-0.2960	0.3176	0.5680
Missing FICO indicators for loans originate 1992 and later and potentially available for scoring.	fico_000	No score generated on loan submitted for scoring by Unicon.	-0.0880	-0.2854	-0.1011	-0.2253	0.1263	0.0036
	fico_999	Loan not submitted for scoring or from time period without scores.	-0.3230	-0.0207	0.0275	-0.3150	0.3928	0.0838
Loan was sampled from subset of FHA loans Unicon Corp submitted to credit repositories to obtain FICO information.	unicon_loan	Loan sampled from Unicon subsample.	-0.0269	-0.0577	0.7436	-0.3549	0.2794	0.3942
Mortgage age function. Piece-wise linear spline for ages up to specified knot points (shown as the number of quarters since origination). Estimated coefficient gives the slope of the function for each linear segment.	age1	Age spline function knot values given in respective columns to the right next to the corresponding coefficient estimates.	2 0.4806	2 0.2211	2 0.2136	4 0.0447	4 0.1716	4 0.1629
	age2		4 0.1903	4 0.1228	4 0.1994	8 0.0207	8 -0.0645	8 0.0220
	age3		8 0.0804	8 -0.0273	8 0.1481	> 8 0.0048	> 8 0.0074	12 0.0335
	age4		12 0.0150	12 0.0039	12 -0.0477			16 -0.0116
	age5		20 0.0185	16 -0.0332	16 -0.0096			20 -0.0327
	age6		> 20 -0.0101	>16 -0.0020	>16 -0.0728			> 20 -0.0418
Default duration function. Piece-wise linear spline for durations (quarters) up to specified knot points. Estimated coefficient gives the slope of the function for each linear segment.	deftime1	Default duration spline function knot values given in respective columns to the right next to the corresponding coefficient estimates.				1 -0.1009	1 -0.0679	1 0.7365
	deftime2					2 -0.3116	2 -0.1444	2 0.2242
	deftime3					3 -0.1914	3 -0.0809	3 -0.0442
	deftime4					4 -0.5874	4 0.0922	4 -0.3397
	deftime5					≥ 5 0.0000	≥ 5 0.0000	≥ 5 0.0000
Intercept term.	constant	1	-7.4163	-3.6701	-9.9368	-1.3699	-3.3572	-3.7025
Estimation Sample Count	N	Total	1,328,803	1,388,586	1,300,867	66,764	60,690	64,746
- Log Likelihood (model)	L1		-111,496.89	-313,607.13	-7,094.26	-23,341.50	-8,056.95	-18,345.38
- Log Likelihood (constant)	L0		-119,556.42	-329,794.95	-7,767.66	-24,617.31	-24,617.31	-20,108.19
Degrees of Freedom	d.f.	L1 - L0 parameters	60	60	56	58	59	63
Chi-Squared Test Value	Chi-square	- 2*(L0-L1)	16,119	32,376	1,347	2,552	33,121	3,526

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

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. This 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 2010) 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 2011 through FY 2017) 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 and E. 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; but these are intermediate results and do not have impacts on the Fund's cash flows. Using detailed loan-level characteristics, we estimated the prepayment and claim probabilities and then generated respective cash flows for individual loans. 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.

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 loan stratifications on a probabilistic basis and then aggregated according to the product type and origination year, and 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 for a specific pool of loans.

- **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 for a specific pool of loans.

- **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 for this analysis 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 NAHA 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. The 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 will lower the upfront premium of all mortgages to 1.0 percent. The annual premium for loans with 30-year terms will be increased to 0.85 percent if the LTV ratio is less than 95 percent and 0.90 percent if the LTV ratio exceeds 95 percent. For loans with

15-year terms, an annual premium of 0.25 percent will be charged if the LTV is higher than 90 percent.

Exhibit B-2

Upfront Premium Rates for New FHA Originations		
Fiscal Year	**30yr Loans, Fixed or Adjustable Rate (%)**	**15yr Loans, Fixed or Adjustable Rate (%)**
9/1/83 to 6/30/91	3.80	2.40
7/1/91 to 9/30/92	3.80	2.00/3.80[b]
10/1/92 to 4/16/94	3.00	2.00
4/17/94 to 9/30/96	2.25	2.00
10/1/96 to 9/21/97	2.25/2.00[a]	2.00
9/22/97 to 12/31/00	2.25/2.00/1.75[a]	2.00
1/1/01 to 9/30/08	1.50	1.50
10/1/08 to 3/31/10	1.75/1.50[c]	1.75/1.50[c]
4/1/10 to 10/3/10	2.25	2.25
10/4/10 and later	1.00	1.00

[a] For first-time homebuyers who received homeowner counseling.
[b] For 15-year streamline refinance loans.
[c] For all types of streamline refinance loans.

Exhibit B-3

Annual Premium Rate for 15- and 30-Year Mortgages		
Fiscal Year	**30yr Loans, Fixed or Adjustable**	**15yr Loans, Fixed or Adjustable**
Prior to 9/1/1983	0.5% for life of loan	0.5% for life of loan
9/1/83 to 6/30/91	None	None
7/1/91 to 9/30/92	varies by LTV category[a]	varies by LTV category[a]
10/1/92 to 12/31/00	varies by LTV category[b]	varies by LTV category[c]
1/1/01 to 9/30/08	0.5% until loan balance reaches 78% of original property value, minimum of 5 years	varies by LTV category[d]
10/1/08 to 10/3/10	0.50% if LTV≤ 95% 0.55% if LTV > 95% until loan balance reaches 78% of original property value	0% if LTV ≤ 90% 0.25% if LTV > 90% until loan balance reaches 78% of original property value
10/4/10 and later	0.85% if LTV≤ 95% 0.90% if LTV > 95% until loan balance reaches 78% of original property value	0% if LTV≤ 90% 0.25% if LTV > 90% until loan balance reaches 78% of original property value

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**	**Up-front Premium**	**Annual Premium**
Prior to 9/1/1983	None	None	None	None
9/1/83 to 6/30/91	3.80%	None	2.40%	None
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 and later	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

[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.

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 losses due to claims. FHA pays the claim to the lender when 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

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

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. Note that the claim rate and the prepayment rate are in terms of the number of loans instead of the UPB. Claim and prepayment rates do vary by loan size. The potential impact of the loan size difference is controlled in this analysis by categorizing loans into either different relative loan sizes or different relative house price categories, within different local housing markets and time periods. Loans within a specific relative house price stratification tend to have similar original mortgage loan amounts. As a result, calibrating the rates in terms of the number of loans would yield a close approximation to the results by calibrating the rates in terms of UPBs.

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. For additional technical details, refer to Appendix E.

C. Loss Mitigation Expenses

HUD initiated the loss mitigation program in 1996 in an effort to provide opportunities for distressed FHA insured borrowers to cure and 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 mortgagee and 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 exponentially from FY 2000 to FY 2009. There were 11,402 loss mitigation claims in FY 2000 which increased to 122,912 cases in FY 2009. The amount FHA paid in these cases after all adjustments and curtailments was $21.88 million in FY 2000 which increased to $265.51 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 loss payment during the quarter as the explanatory variable:

Loss Mitigation Payment = 0 + b Claim Payment*

Using aggregated loss mitigation payment amounts and total claim payments during the period of FY 2002 to FY 2009, the regression has an overall R-square of 0.97463. The model uses quarterly data from FY 2002 to FY 2009 and the coefficient of claim payment is 0.058085. That means that loss mitigation expenses are typically about 5.8 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. 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 prepay 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 2011 is multiplied by 0.9869 to convert it into a present value in FY 2010. The discount rates used in this Review are lower than the corresponding discount rates in last year's Review since the forecasted level of interest rates has risen.

Exhibit B-6

Year that Cash Flow Occurs	Discount Factor	Year that Cash Flow Occurs	Discount Factor	Year that Cash Flow Occurs	Discount Factor
2011	0.9869	2022	0.6028	2033	0.3475
2012	0.9599	2023	0.5744	2034	0.3299
2013	0.9220	2024	0.5470	2035	0.3132
2014	0.8822	2025	0.5208	2036	0.2973
2015	0.8433	2026	0.4956	2037	0.2821
2016	0.8045	2027	0.4715	2038	0.2676
2017	0.7659	2028	0.4484	2039	0.2538
2018	0.7294	2029	0.4264	2040	0.2407
2019	0.6952	2030	0.4053	2041	0.2283
2020	0.6631	2031	0.3851	2042	0.2165
2021	0.6324	2032	0.3658	2043	0.2053

B. Calculating the Economic Value

The economic value of the Fund as of the end of FY 2010 was calculated first by determining the present value of the future cash flows for all existing books of business as of September 30, 2010. This figure was then added to the capital resources of the Fund, estimated as of the same date.

For each fiscal year beyond 2010, 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 (%)**
2011	1.33%
2012	2.81%
2013	4.11%
2014	4.51%
2015	4.61%
2016	4.82%
2017	5.04%

Appendix C

Data for Loan Performance Simulation

Appendix C: Data for Loan Performance Simulations

This appendix describes the methodology used to produce 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; with the transitions including current-to-default, current-to-claim, current-to-prepay, default-to-cure, default-to-claim and default-to-prepay events.

For loans that did not terminate and are still in either current or in default status as of FY 2010 (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 2017. The total endorsement volumes for FY 2010 through FY 2017 are provided by HUD from their internal demand model. These forecasted volumes are allocated among the six loan product types following their distribution in the most recent FY 2009 Q2 to FY 2010 Q1 endorsements. HUD estimates that streamline refinance loans will account for about 10 percent of the future endorsements. In addition to the total endorsement volume, HUD also projected detailed compositions by LTV and credit score in future books of business. Exhibits C-1 and C-2 present the resulting forecast composition of future books.

Exhibit C-1

Projected Originations By Mortgage Type (Percentage of Mortgages by Loan Counts)			
Fiscal Year	**Purchase Mortgages**		**Streamline Refinancing**
	Purchase	**Fully Underwritten Refinance**	
2010	66.1%	21.4%	12.5%
2011	69.5%	19.3%	11.2%
2012	73.7%	17.1%	9.2%
2013	75.0%	15.0%	10.0%
2014 – 2017	82.0%	8.0%	10.0%

Exhibit C-2

	Projected Composition of FY 2010 Purchase Loans							
Loan-to-Value Ratio	**FICO Score Range**							
	Missing	**300-499**	**500-579**	**580-619**	**620-659**	**660-679**	**680-719**	**720-850**
$X \leq 90$	0.09%	0.00%	0.06%	0.31%	1.74%	0.95%	1.61%	2.65%
$90 < X \leq 95$	0.03%	0.00%	0.04%	0.28%	1.42%	0.87%	1.69%	3.36%
$95 < X$	0.32%	0.00%	0.20%	2.66%	22.29%	11.24%	19.08%	29.07%

	Projected Composition of FY 2011 Purchase Loans							
Loan-to-Value Ratio	**FICO Score Range**							
	Missing	**300-499**	**500-579**	**580-619**	**620-659**	**660-679**	**680-719**	**720-850**
$X \leq 90$	0.10%	0.00%	0.20%	0.66%	1.77%	0.93%	1.44%	2.14%
$90 < X \leq 95$	0.05%	0.00%	0.00%	0.47%	1.42%	0.83%	1.61%	3.04%
$95 < X$	0.38%	0.00%	0.00%	6.24%	21.32%	10.72%	18.50%	28.18%

Loan-to-Value Ratio	Projected Composition of FY 2012 Purchase Loans							
	FICO Score Range							
	Missing	300-499	500-579	580-619	620-659	660-679	680-719	720-850
X ≤ 90	0.13%	0.00%	0.37%	1.01%	1.88%	0.94%	1.37%	1.92%
90 < X ≤ 95	0.05%	0.00%	0.00%	0.69%	1.51%	0.84%	1.57%	2.77%
95 < X	0.45%	0.00%	0.00%	8.66%	20.82%	10.40%	17.91%	26.69%

Loan-to-Value Ratio	Projected Composition of FY 2013 Purchase Loans							
	FICO Score Range							
	Missing	300-499	500-579	580-619	620-659	660-679	680-719	720-850
X ≤ 90	0.07%	0.00%	0.56%	1.01%	1.50%	0.71%	1.16%	1.60%
90 < X ≤ 95	0.03%	0.00%	0.00%	0.90%	1.47%	0.78%	1.41%	2.16%
95 < X	0.73%	0.00%	0.00%	12.38%	21.56%	10.75%	18.43%	22.80%

Loan-to-Value Ratio	Projected Composition of FY 2014 to FY 2017 Purchase Loans							
	FICO Score Range							
	Missing	300-499	500-579	580-619	620-659	660-679	680-719	720-850
X ≤ 90	0.00%	0.00%	0.76%	1.01%	1.12%	0.48%	0.96%	1.29%
90 < X ≤ 95	0.00%	0.00%	0.00%	1.10%	1.42%	0.71%	1.25%	1.55%
95 < X	1.00%	0.00%	0.00%	16.10%	22.30%	11.10%	18.95%	18.90%

Exhibit C-3

Loan-to-Value Ratio	Projected Composition of FY 2010 Fully Underwritten Refinance Loans							
	FICO Score Range							
	Missing	300-499	500-579	580-619	620-659	660-679	680-719	720-850
X ≤ 90	0.07%	0.03%	0.70%	1.99%	16.17%	9.06%	14.52%	18.20%
90 < X ≤ 95	0.01%	0.00%	0.04%	0.31%	3.52%	2.23%	4.19%	6.54%
95 < X	0.02%	0.00%	0.05%	0.37%	4.91%	3.07%	5.49%	8.51%

Loan-to-Value Ratio	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	0.09%	0.09%	1.76%	4.91%	15.50%	7.87%	10.79%	11.94%
90 < X ≤ 95	0.04%	0.00%	0.00%	2.01%	6.35%	3.64%	6.09%	7.85%
95 < X	0.04%	0.00%	0.00%	1.36%	5.37%	2.92%	4.84%	6.61%

Loan-to-Value Ratio	Projected Composition of FY 2012 Fully Underwritten Refinance Loans							
	FICO Score Range							
	Missing	300-499	500-579	580-619	620-659	660-679	680-719	720-850
X ≤ 90	0.10%	0.00%	2.76%	6.92%	14.34%	6.77%	8.70%	9.28%
90 < X ≤ 95	0.05%	0.00%	0.00%	3.67%	8.19%	4.32%	6.72%	7.88%
95 < X	0.04%	0.00%	0.00%	2.12%	5.54%	2.78%	4.26%	5.57%

Loan-to-Value Ratio	Projected Composition of FY 2013 Fully Underwritten Refinance Loans							
	FICO Score Range							
	Missing	300-499	500-579	580-619	620-659	660-679	680-719	720-850
X ≤ 90	0.05%	0.00%	7.07%	11.14%	16.13%	7.21%	10.76%	10.66%
90 < X ≤ 95	0.03%	0.00%	0.00%	3.36%	6.03%	3.25%	4.72%	5.52%
95 < X	0.02%	0.00%	0.00%	1.96%	3.85%	1.95%	2.89%	3.41%

Loan-to-Value Ratio	Projected Composition of FY 2014 to FY 2017 Fully Underwritten Refinance Loans							
	FICO Score Range							
	Missing	300-499	500-579	580-619	620-659	660-679	680-719	720-850
X ≤ 90	0.00%	0.00%	11.39%	15.36%	17.93%	7.65%	12.82%	12.04%
90 < X ≤ 95	0.00%	0.00%	0.00%	3.04%	3.86%	2.17%	2.72%	3.16%
95 < X	0.00%	0.00%	0.00%	1.80%	2.16%	1.13%	1.52%	1.25%

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 three quarters of FY 2009 FQ2 and the first quarter of FY 2010.

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 assure consistency with future economic conditions and FHA future demand forecasts. For example, the starting mortgage coupons for all products are updated to reflect forecasted market conditions at the time of origination of these hypothetical 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. This preserves the underlying variability in the original coupon rates, but moves them up or down to correspond to market conditions at the time of origination.

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 to the same FHA borrower. Thus, we need to preserve the lag structure between SRs and their prior loans by modifying the "effective age" (time since origination of the fully-underwritten mortgage) to match the lags observed at the loan level for the historical source loans. Thus, if a future loan origination is duplicated from an FY 2009-2010 SR origination that is linked to a prior loan originated 2 years previously, the future loan origination based on that particular historical origination assumes the same lag and same effective age when estimating the current LTV. This approach to duplicating historical loan-level information to generate future loan cohorts gives the future cohorts detailed characteristics known to resemble recent historical FHA endorsements. The overall distributions based on key variables such as product type, LTV, and FICO scores are subsequently modified to conform to FHA's future demand forecasts.

The future mortgage cash flows for individual loan stratifications are then aggregated to derive the total cash flows for the entire Fund. The total cash flows are calculated as weighted average cash flows among individual stratifications, with the weights calibrated to the future demand and compositions forecasted by HUD.

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 the Moody's forecast of the FHFA MSA-level and Census Region-level housing price indexes. Because the Moody's 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 regional-level house price index (HPI). When using the Moody's local house price forecast 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 (11) 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, τ 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 twelve 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 regional 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 one of the nine Census-division 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 Census region average appreciation rates implied 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*, online first, DOI: 10.1007/s11146-009-9194-y, 2010, http://www.springerlink.com/content/9045t158u0328t81/.

Appendix D

Economic Forecasts

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 2010 forecast of the U.S. economy published by Moody's Analytics . The economic components of the Moody's forecast 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

Summary of the data used in the base-case scenario are 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 2010 through FY 2040.

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 (%)
2010	341.5	4.89	0.39	3.46
2011	337.1	5.76	0.95	4.40
2012	338.9	6.94	2.85	5.53
2013	342.1	6.51	4.09	4.99
2014	356.6	6.20	4.24	4.60
2015	373.5	6.12	4.12	4.50
2016	387.9	6.07	4.08	4.47
2017	402.4	6.05	4.08	4.45
2018	417.0	6.01	4.08	4.41
2019	432.2	5.97	4.08	4.38
2020	447.7	5.92	4.27	4.33

[a] Source: Moody's Analytics July 2010 Forecast. Numbers are average levels during each fiscal year.

Alternative Economic Scenarios

To conduct sensitivity analysis of the Fund's economic value, five alternative scenarios were used to assess the financial viability of the Fund. The first four alternative scenarios are based directly on the July 2010 alternative economic forecasts published by Moody's Economy.com, and modified as described below. We developed the last scenario separately to test the impact of a volatile interest rate forecast. These five scenarios are:

1. Stronger Recovery in 2010 (Moody's S1)
2. Mild Second Recession (Moody's S2)
3. Deeper Second Recession (Moody's S3)
4. Complete Collapse, Depression (Moody's S4)
5. Volatile Interest Rate Path

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, not the HPI. 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 2012 Q2, 2012 Q3, 2013 Q3 and 2013 Q4 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.

Exhibit D-2 shows the future movements of the simple average of MSA-level HPI under the base-case and the first four alternative economic scenarios with the above modification in place. This graph shows clearly 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 late FY 2015, and not until after FY 2019 for all the pessimistic scenarios. Exhibit D-3 shows the forecasted interest rate of 30-year fixed-rate mortgages in the corresponding scenarios.

Exhibit D-2

Path of the Future National House Price Index in Different Scenarios

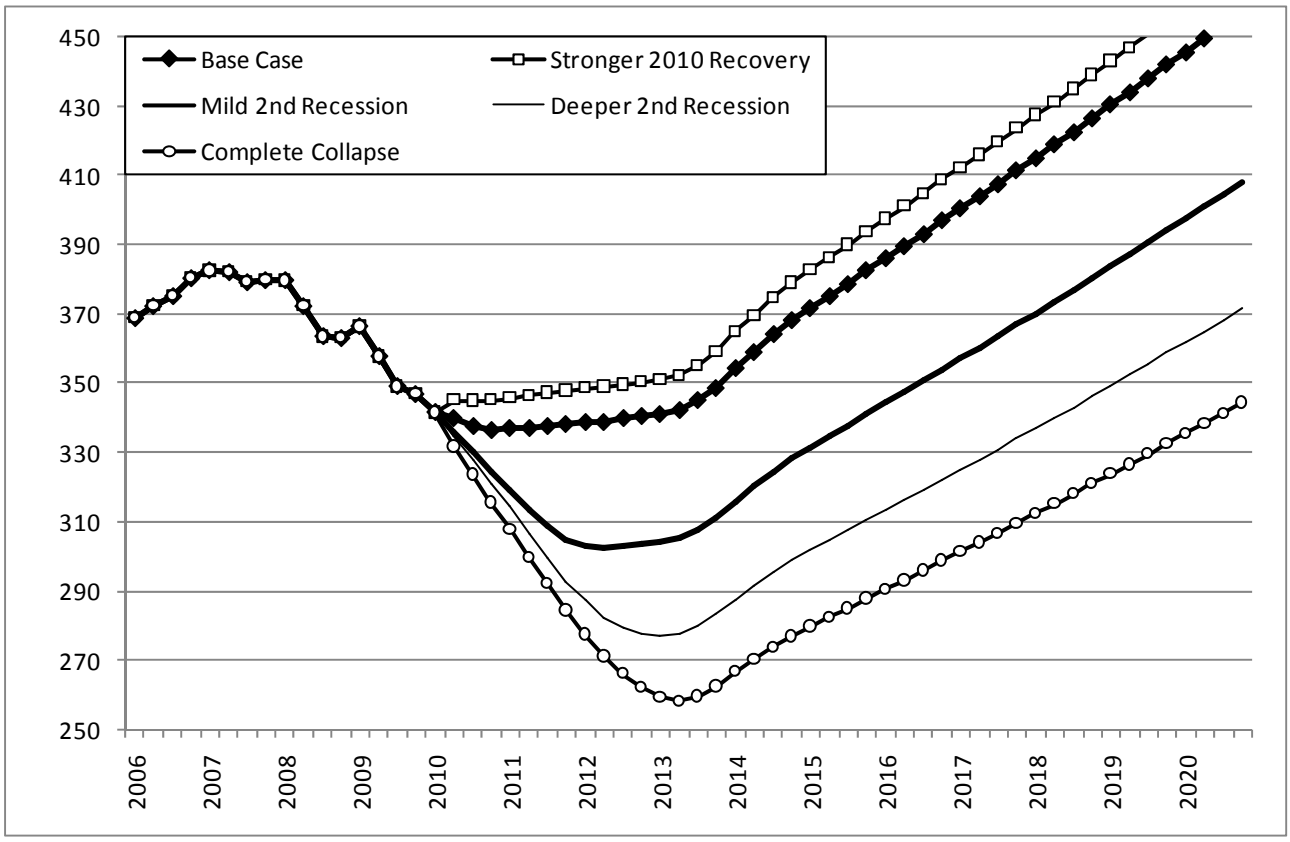


Exhibit D-3

Path of the Future Mortgage Interest Rates (%) in Different Scenarios

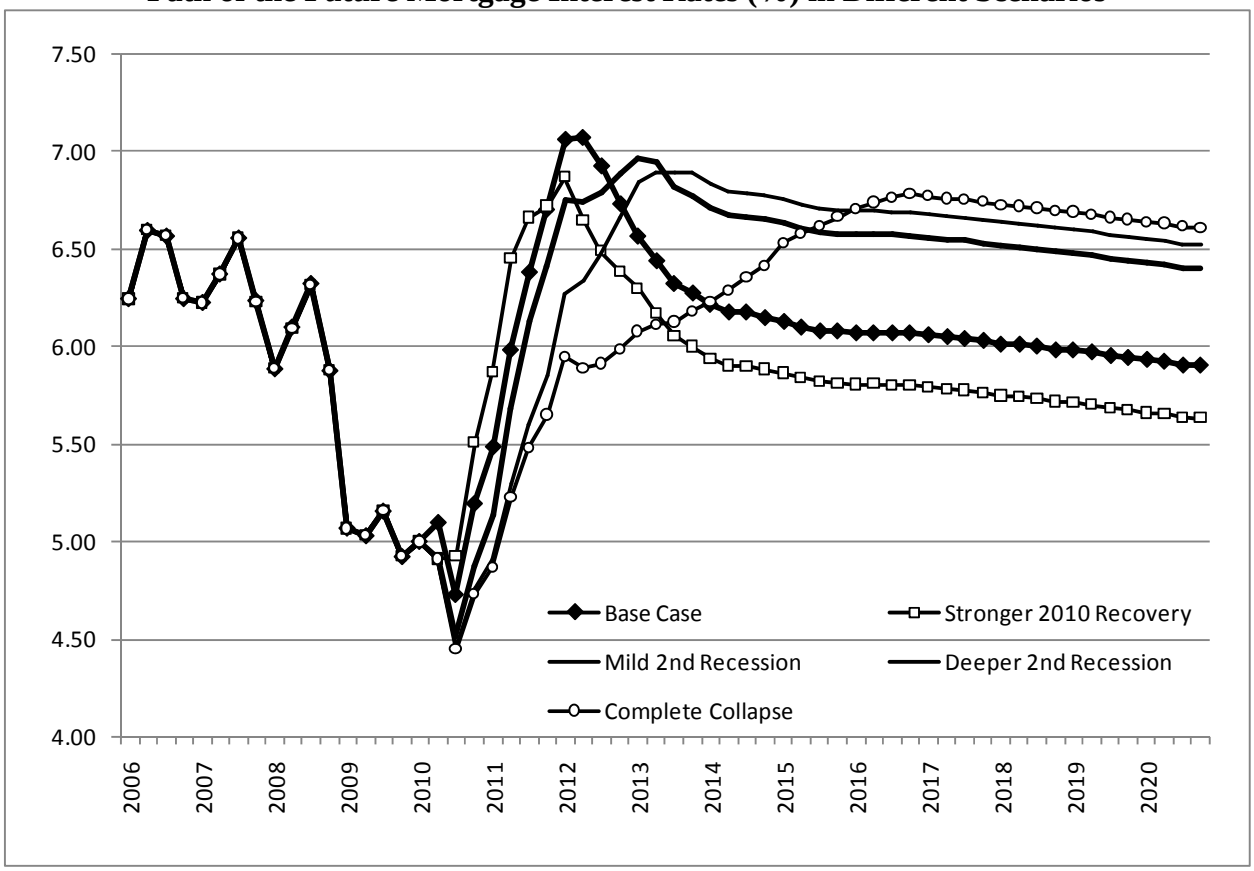
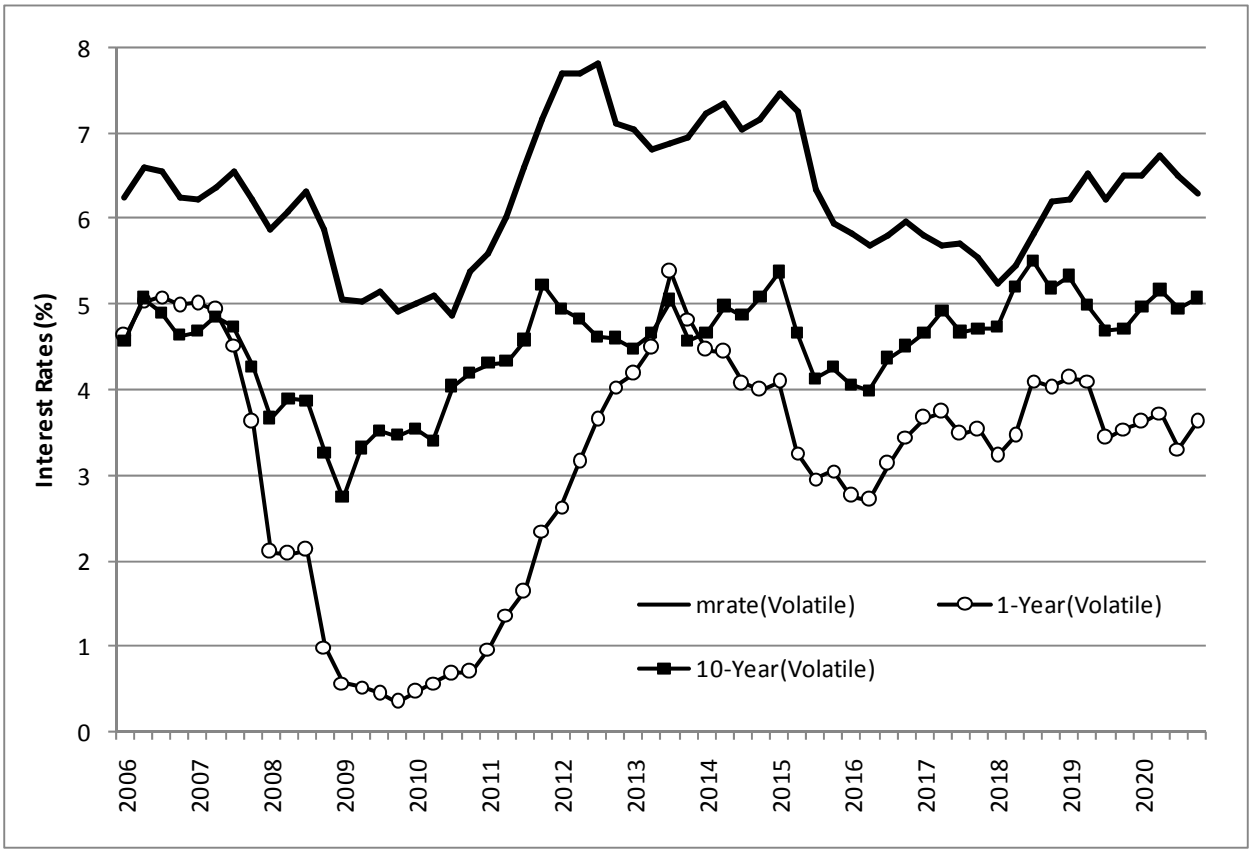


Exhibit D-4 shows both the recent history as well as future movements of the 30-year fixed-rate mortgage commitment rates and the 1-year and 10-year Treasury rates in the volatile interest rate path scenario. This volatile path was selected from a sample of 1,000 stochastic interest rate paths provided by Moody's associated with their July 2010 base-case forecast. This path was selected to provide a volatile-rate scenario and to better represent interest rate fluctuations typically observed in the market. We selected the interest rate path that was closest to the deterministic base-case projection based on the sum of squared deviations from the base-case projection among all 1,000 paths. It is thus a stylized volatile base-case scenario. Its basic effect is to produce higher prepayment rates than the smooth base-case scenario. The Treasury rates and mortgage rates used in this scenario are those associated with the same interest rate path.

Exhibit D-4

Interest Rates of the Volatile Interest Rate Path Scenario



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

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Appendix E

Loss Rate Analysis

Appendix E: Loss Severity Model

This Appendix describes the loss severity model used in the FY 2010 Actuarial 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 FY 2009, previous Reviews used fixed loss severity rates. The loss rate model used in this Review was developed in FY 2009 and updated for this year's Review using observations through FY 2009. Section I summarizes the model specification and estimation approach, Section II describes 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.

Acquisition Cost = Unpaid Principal Balance + Foregone Interest + 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 and repairs tax payments and expenses incurred preparing the property for sale .the property. 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:

Loss Amount = Acquisition Cost + Holding Cost - Sales Price + 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 claimed by the lender. The loss amount is reported as the acquisition cost to HUD.

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

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 year over the 1981-2009 period. 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	33.85%
2002	31.65%
2003	32.63%
2004	35.58%
2005	38.74%
2006	42.80%
2007	51.55%
2008	60.42%
2009	61.23%

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

Exhibit E-2

Termination Year	Distribution of Terminations by Claim Type (Percent)				
	Conveyance	Assignment/ Asset Sales	Coinsurance	Without Conveyance	Pre-Foreclosure
1999	95.30	0.11	0.02	0.00	4.57
2000	95.03	0.09	0.01	0.00	4.86
2001	95.03	0.01	0.00	0.00	4.96
2002	94.33	0.00	0.00	0.00	5.66
2003	86.73	8.35	0.00	0.00	4.92
2004	85.56	8.42	0.00	0.00	6.02
2005	83.29	9.80	0.00	0.00	6.92
2006	89.37	2.83	0.00	0.00	7.80
2007	92.80	0.00	0.00	0.00	7.20
2008	93.11	0.00	0.00	0.06	6.83
2009	90.21	0.00	0.00	0.04	9.75

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, forgone 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 character 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 per foreclosed property, so 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 ε_i is the error term.

B. Estimation Sample

The sample used to estimate the loss severity model for the FY 2010 Review consists of claimed loans under the categories conveyance and pre-foreclosure sales with 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 2009. However, there have been substantial changes made to the FHA loss recovery policies over time. 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 cost have been recorded. Many claims associated with loans terminated in FY 2010 have not yet been resolved, so the loss rates for FY 2010 claims have not yet been reported. Thus, loans with claims in FY 2010 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 679,245 loans claimed over these past 10 years. This sample includes 94.78 percent of the total claims over this period.

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:

1. Fixed initial loan characteristics, including mortgage product type, origination year, original loan-to value (LTV) ratio, original loan amount;

2. Fixed initial borrower characteristics, including borrower credit scores and indicators of the source of downpayment assistance where relevant;

3. Dynamic variables based entirely on loan information, including mortgage age, scheduled amortization of the loan balance, current loan-to-value; and

4. Dynamic variables derived by combining loan information with economic time series such as house price appreciation rates and interest rates.

Exhibit E-3 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 of the variables are the same 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, original LTV, origination year, termination year, yield curve slope, and loan size. Only 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 two variables were constructed.

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. The CLTV has significant explanatory power for estimating the loss rate.

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-3
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	
Downpayment Source		
Nonprofit	Non-profit gift	Downpayment assistance provide by non-profit.
Unicon		
Unicon	Loan is member of Unicon sample	Loan was sampled from subset of FHA loans Unicon Corp submitted to credit repositories to obtain 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	$39 < X$	
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	

Variable Name	Value	Description
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	
LTV		
ltvcat_cat_1	$X < 80$	Loan-to-value at origination.
ltvcat_cat_2	$80 \leq X < 90$	
ltvcat_cat_3	$90 \leq X < 95$	
ltvcat_cat_4	$95 \leq X < 97$	
ltvcat_cat_5	$97 \leq X$	
CLTV		
cltv_1	$X < 60$	Current loan-to-value at the claim date. House price is updated by state 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	$X < -0.12$	State-level house price appreciation rate during the 8 quarters surrounding the termination 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	$0 \leq X < 0.04$	

Variable Name	Value	Description
hpa4_6	$0.04 \leq X < 0.08$	
hpa4_7	$0.08 \leq X < 0.12$	
hpa4_8	$0.12 \leq X < 0.16$	
hpa4_9	$0.16 \leq X$	
Begin Amortization Year		
fy_1975_1986_cat_1	$X \geq 1986$	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 $1992 \leq X$	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	$1986 \leq X < 1992$	
fY_1996_XXXX_cat_1	$X \leq 1996$	Post-FY1996 origination. After changes in FHA underwriting requirements.
fY_1996_XXXX_cat_2	$X > 1996$	
Termination Year		
term_fy_2001_XXXX_cat_1	$X \leq 2001$	Dummy variables based on termination year, with regime change after 2001.
term_fy_2001_XXXX_cat_2	$X > 2001$	
Yield Curve Slope		
ycslopecat_cat_1	$0 \leq X \leq 1$	Yield curve slope measured as ratio of 10-year CMT to 1-year CMT rates.
ycslopecat_cat_2	$1 < X \leq 1.2$	
ycslopecat_cat_3	$1.2 < X \leq 1.5$	
ycslopecat_cat_4	$X > 1.5$	
Loan Size		
loancat_cat_1	$0 < X \leq 60$	Relative loan size measured as relative percentage of average size loan originated in the same state in the same year.
loancat_cat_2	$60 < X \leq 90$	
loancat_cat_3	$90 < X \leq 110$	
loancat_cat_4	$110 < X \leq 140$	
loancat_cat_5	$X > 140$	

III. Estimation Results

Exhibit E-4 presents the regression coefficients and their standard errors and t-statistics.

Exhibit E-4

Variable	Coefficient	Standard Error	t - statistic
refinance_cat_2	0.0584	0.0020	29.83
unicon	0.0633	0.0018	36.17
judicial_cat_2	0.1103	0.0008	138.88
nonprofit_cat	0.0405	0.0013	31.48
ycslopecat_cat_2	-0.0018	0.0012	-1.46
ycslopecat_cat_3	-0.0196	0.0016	-12.38
ycslopecat_cat_4	-0.0570	0.0012	-48.49
fy_1975_1985_cat_2	0.4075	0.0056	72.71
fy_1986_1991_cat_2	0.0981	0.0033	29.98
fy_1996_XXXX_cat_2	0.0106	0.0014	7.38
term_fy_2001_XXXX_cat_2	0.0293	0.0013	22.22
age2	0.0637	0.0049	12.92
age3	0.1010	0.0050	20.27
age4	0.1382	0.0050	27.4
age5	0.1746	0.0051	33.99
age6	0.2093	0.0052	40.05
age7	0.2521	0.0053	47.21
age8	0.2933	0.0055	53.4
age9	0.3369	0.0057	59.17
age10	0.3685	0.0059	62.08
age11	0.4739	0.0060	79.19
loan_type_2	0.1674	0.0048	34.52
loan_type_3	0.0175	0.0013	13.41
loan_type_4	-0.0795	0.0023	-34.72
loan_type_5	0.0721	0.0068	10.57
loan_type_6	-0.0572	0.0036	-15.75
fico_000	0.0607	0.0019	32.06
fico_300_499	0.0754	0.0035	21.81
fico_500_579	0.0434	0.0017	25.65
fico_580_619	0.0176	0.0017	10.3
fico_660_679	-0.0083	0.0027	-3.13
fico_680_719	-0.0196	0.0027	-7.39

Variable	Coefficient	Standard Error	t - statistic
fico_720_850	-0.0217	0.0037	-5.93
fico_999	0.0848	0.0021	39.94
ltvcat_cat_2	-0.0091	0.0035	-2.63
ltvcat_cat_3	-0.0213	0.0034	-6.33
ltvcat_cat_4	-0.0325	0.0034	-9.68
ltvcat_cat_5	-0.0221	0.0034	-6.57
cltv_2	0.0937	0.0017	56.46
cltv_3	0.1957	0.0018	106.46
cltv_4	0.2712	0.0021	128.56
cltv_5	0.3066	0.0028	111.41
cltv_6	0.3099	0.0039	79.68
loancat_cat_2	-0.1856	0.0012	-160.4
loancat_cat_3	-0.2902	0.0013	-228.57
loancat_cat_4	-0.3464	0.0013	-265.66
loancat_cat_5	-0.3784	0.0017	-223.89
hpa4_2	0.0155	0.0033	4.69
hpa4_3	-0.1036	0.0033	-30.94
hpa4_4	-0.1589	0.0031	-50.96
hpa4_5	-0.2583	0.0032	-80.38
hpa4_6	-0.3433	0.0030	-113.42
hpa4_7	-0.3892	0.0030	-127.74
hpa4_8	-0.3937	0.0032	-123.93
hpa4_9	-0.4169	0.0031	-134.96
_cons	0.5534	0.0072	76.38
Summary Statistics			
Number of observations	596493		
Adjusted R-Square	0.3017		
F	5335.4		
Prob > F	0.0000		

Appendix F

Econometric Results

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
1981	0.13	1.67	3.69	3.41	3.50	3.31	4.14	4.84	3.68	3.00	2.53	2.10	1.97	1.87	1.80	1.33	1.22	1.17	0.83	0.81	0.62	0.58	0.51	0.30	0.38	0.33	0.26	0.17	0.24	**0.31**
1982	0.18	2.55	4.87	5.75	6.32	7.65	8.48	6.23	4.44	3.62	3.45	2.74	2.84	2.77	1.82	1.96	2.06	1.46	1.22	1.03	1.27	1.24	1.05	1.15	0.54	0.33	0.20	0.45	**0.00**	**0.01**
1983	0.03	0.60	1.72	2.33	3.37	4.73	4.16	2.99	2.55	2.38	2.16	2.26	2.05	1.50	1.51	1.49	1.41	1.17	1.09	0.71	0.79	0.79	0.53	0.52	0.34	0.42	0.21	**0.40**	**0.02**	**0.01**
1984	0.07	1.23	2.95	4.61	6.38	5.59	3.92	3.08	2.77	2.46	2.47	2.16	1.79	1.61	1.27	1.22	1.20	0.91	0.65	0.56	0.43	0.27	0.32	0.23	0.18	0.23	**0.57**	**0.02**	**0.01**	**0.01**
1985	0.05	1.16	3.68	6.20	5.47	4.09	3.41	3.04	2.91	2.76	2.52	1.91	1.81	1.60	1.13	1.25	0.88	0.70	0.53	0.41	0.34	0.28	0.18	0.27	0.21	**0.19**	**0.01**	**0.01**	**0.01**	**0.01**
1986	0.04	0.74	2.20	2.51	2.27	2.03	1.82	1.70	1.81	1.81	1.44	1.36	1.20	1.07	0.85	0.69	0.60	0.50	0.47	0.33	0.24	0.25	0.19	0.23	**0.22**	**0.07**	**0.05**	**0.04**	**0.04**	**0.03**
1987	0.04	0.53	1.21	1.38	1.39	1.34	1.23	1.33	1.31	1.12	1.11	0.99	0.90	0.81	0.49	0.44	0.47	0.46	0.34	0.24	0.19	0.16	0.27	**0.22**	**0.11**	**0.08**	**0.07**	**0.06**	**0.05**	**0.04**
1988	0.04	0.53	1.20	1.51	1.69	1.65	1.89	1.94	1.58	1.54	1.41	1.32	1.12	0.74	0.66	0.64	0.64	0.48	0.39	0.27	0.28	0.31	**0.58**	**0.19**	**0.13**	**0.10**	**0.09**	**0.07**	**0.06**	**0.04**
1989	0.03	0.52	1.41	1.85	2.07	2.51	2.69	2.28	2.14	1.83	1.64	1.47	0.98	0.85	0.78	0.75	0.66	0.53	0.42	0.37	0.41	**0.45**	**0.25**	**0.17**	**0.13**	**0.11**	**0.09**	**0.07**	**0.06**	**0.04**
1990	0.02	0.42	1.21	1.68	2.20	2.31	1.91	1.94	1.70	1.53	1.35	0.92	0.76	0.79	0.76	0.57	0.56	0.53	0.50	0.42	**0.52**	**0.28**	**0.21**	**0.16**	**0.14**	**0.11**	**0.09**	**0.07**	**0.05**	**0.04**
1991	0.02	0.44	1.26	1.90	2.27	1.89	1.93	1.73	1.55	1.44	0.93	0.81	0.76	0.78	0.73	0.55	0.45	0.58	0.51	**0.51**	**0.43**	**0.30**	**0.23**	**0.19**	**0.15**	**0.12**	**0.09**	**0.07**	**0.06**	**0.04**
1992	0.02	0.33	0.91	1.30	1.32	1.58	1.51	1.36	1.23	0.85	0.72	0.64	0.65	0.55	0.48	0.37	0.46	0.47	**0.45**	**0.31**	**0.24**	**0.19**	**0.15**	**0.12**	**0.10**	**0.08**	**0.07**	**0.05**	**0.04**	**0.03**
1993	0.01	0.24	0.65	0.92	1.24	1.22	1.11	0.99	0.65	0.55	0.54	0.57	0.47	0.37	0.31	0.34	0.41	**0.57**	**0.26**	**0.22**	**0.16**	**0.12**	**0.09**	**0.08**	**0.06**	**0.05**	**0.04**	**0.03**	**0.03**	**0.02**
1994	0.01	0.26	0.70	1.14	1.29	1.18	0.97	0.63	0.53	0.50	0.51	0.43	0.33	0.29	0.27	0.34	**0.51**	**0.35**	**0.28**	**0.20**	**0.15**	**0.11**	**0.09**	**0.07**	**0.06**	**0.05**	**0.03**	**0.03**	**0.02**	**0.02**
1995	0.03	0.41	1.43	2.21	2.36	2.15	1.55	1.35	1.51	1.43	1.12	0.97	0.82	0.78	0.84	**1.21**	**0.73**	**0.56**	**0.42**	**0.33**	**0.25**	**0.20**	**0.16**	**0.12**	**0.10**	**0.08**	**0.06**	**0.05**	**0.04**	**0.03**
1996	0.01	0.40	1.42	2.14	2.17	1.63	1.44	1.66	1.66	1.42	1.14	0.97	0.94	0.98	**1.20**	**0.86**	**0.70**	**0.52**	**0.40**	**0.32**	**0.26**	**0.21**	**0.16**	**0.13**	**0.10**	**0.08**	**0.06**	**0.05**	**0.04**	**0.03**
1997	0.02	0.54	1.68	2.30	1.97	1.94	2.21	2.15	1.84	1.50	1.25	1.27	1.24	**1.51**	**1.02**	**0.83**	**0.67**	**0.53**	**0.42**	**0.35**	**0.28**	**0.22**	**0.18**	**0.14**	**0.11**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**
1998	0.03	0.48	1.33	1.44	1.56	1.85	2.01	1.79	1.52	1.29	1.24	1.30	**1.63**	**1.06**	**0.90**	**0.65**	**0.50**	**0.38**	**0.31**	**0.24**	**0.19**	**0.15**	**0.11**	**0.09**	**0.07**	**0.06**	**0.04**	**0.03**	**0.03**	**0.02**
1999	0.01	0.39	0.92	1.32	1.88	2.14	1.99	1.59	1.34	1.29	1.36	**1.62**	**1.21**	**1.02**	**0.72**	**0.55**	**0.43**	**0.34**	**0.27**	**0.21**	**0.16**	**0.12**	**0.10**	**0.08**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**
2000	0.03	0.59	2.06	3.87	4.46	3.84	3.12	2.68	2.73	2.48	**3.04**	**2.46**	**1.99**	**1.58**	**1.24**	**0.96**	**0.79**	**0.64**	**0.51**	**0.40**	**0.31**	**0.24**	**0.19**	**0.14**	**0.11**	**0.08**	**0.06**	**0.05**	**0.03**	**0.03**
2001	0.02	0.64	2.30	3.93	3.93	3.34	2.82	2.71	2.52	**3.10**	**2.47**	**2.18**	**1.62**	**1.20**	**0.90**	**0.70**	**0.57**	**0.44**	**0.34**	**0.26**	**0.21**	**0.16**	**0.13**	**0.10**	**0.07**	**0.06**	**0.04**	**0.03**	**0.02**	**0.02**
2002	0.02	0.65	2.32	2.90	2.69	2.41	2.33	2.37	**3.00**	**2.76**	**2.45**	**1.77**	**1.31**	**0.98**	**0.77**	**0.61**	**0.48**	**0.38**	**0.29**	**0.22**	**0.18**	**0.14**	**0.11**	**0.08**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**
2003	0.02	0.68	1.56	1.72	1.64	1.75	1.86	**2.43**	**2.37**	**1.89**	**1.28**	**1.04**	**0.84**	**0.65**	**0.51**	**0.41**	**0.33**	**0.26**	**0.20**	**0.16**	**0.13**	**0.10**	**0.08**	**0.06**	**0.04**	**0.03**	**0.03**	**0.02**	**0.02**	**0.01**
2004	0.07	0.78	1.50	1.86	2.21	2.35	**2.92**	**3.05**	**2.37**	**1.67**	**1.35**	**1.07**	**0.84**	**0.65**	**0.51**	**0.41**	**0.32**	**0.25**	**0.20**	**0.16**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.02**	**0.01**
2005	0.05	0.70	1.84	2.55	3.05	**3.80**	**3.74**	**2.66**	**1.89**	**1.72**	**1.42**	**1.10**	**0.82**	**0.60**	**0.46**	**0.34**	**0.26**	**0.20**	**0.15**	**0.11**	**0.08**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**
2006	0.03	0.74	2.26	3.50	**4.98**	**4.77**	**3.34**	**2.24**	**2.14**	**1.83**	**1.49**	**1.14**	**0.84**	**0.62**	**0.44**	**0.32**	**0.24**	**0.18**	**0.13**	**0.10**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**
2007	0.03	0.91	3.19	**5.42**	**6.35**	**4.92**	**3.21**	**3.03**	**2.60**	**2.17**	**1.75**	**1.34**	**1.00**	**0.73**	**0.54**	**0.40**	**0.29**	**0.21**	**0.15**	**0.11**	**0.08**	**0.06**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**
2008	0.02	0.76	**3.27**	**5.60**	**4.79**	**3.31**	**3.10**	**2.67**	**2.22**	**1.80**	**1.42**	**1.09**	**0.81**	**0.61**	**0.46**	**0.33**	**0.23**	**0.17**	**0.12**	**0.09**	**0.06**	**0.05**	**0.03**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**
2009	0.02	**0.45**	**2.14**	**2.39**	**2.25**	**2.16**	**1.73**	**1.37**	**1.08**	**0.84**	**0.66**	**0.50**	**0.37**	**0.28**	**0.20**	**0.14**	**0.10**	**0.08**	**0.06**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
2010	**0.01**	**0.51**	**1.31**	**1.70**	**1.88**	**1.60**	**1.26**	**0.99**	**0.77**	**0.61**	**0.48**	**0.37**	**0.27**	**0.20**	**0.15**	**0.11**	**0.09**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
2011	**0.04**	**0.54**	**1.53**	**2.37**	**2.59**	**2.34**	**1.88**	**1.47**	**1.18**	**0.95**	**0.75**	**0.58**	**0.44**	**0.32**	**0.24**	**0.18**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
2012	**0.04**	**0.63**	**2.09**	**3.32**	**3.92**	**3.72**	**3.10**	**2.63**	**2.24**	**1.92**	**1.63**	**1.34**	**1.07**	**0.84**	**0.67**	**0.39**	**0.25**	**0.19**	**0.14**	**0.10**	**0.08**	**0.06**	**0.04**	**0.03**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**
2013	**0.04**	**0.59**	**1.93**	**2.89**	**3.15**	**2.79**	**2.29**	**1.86**	**1.57**	**1.32**	**1.07**	**0.82**	**0.61**	**0.47**	**0.34**	**0.23**	**0.16**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
2014	**0.04**	**0.62**	**2.07**	**3.03**	**3.25**	**2.88**	**2.32**	**1.95**	**1.63**	**1.32**	**1.03**	**0.77**	**0.58**	**0.42**	**0.31**	**0.22**	**0.17**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
2015	**0.04**	**0.63**	**2.07**	**3.00**	**3.23**	**2.84**	**2.33**	**1.92**	**1.60**	**1.28**	**0.99**	**0.74**	**0.54**	**0.40**	**0.30**	**0.21**	**0.16**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
2016	**0.04**	**0.65**	**2.11**	**3.08**	**3.26**	**2.96**	**2.47**	**2.00**	**1.61**	**1.28**	**0.99**	**0.71**	**0.52**	**0.39**	**0.29**	**0.21**	**0.15**	**0.11**	**0.09**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
2017	**0.04**	**0.65**	**2.11**	**3.07**	**3.38**	**3.10**	**2.53**	**2.03**	**1.62**	**1.31**	**0.97**	**0.70**	**0.52**	**0.40**	**0.30**	**0.21**	**0.16**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**

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
1981	0.27	0.46	7.25	4.94	6.27	20.29	23.57	11.10	8.47	8.56	9.18	14.39	17.40	18.97	9.95	12.60	11.70	14.63	18.79	12.57	14.99	13.28	14.78	14.84	15.67	18.36	13.06	12.77	17.85	**25.73**
1982	0.46	18.83	10.24	13.55	32.50	31.69	15.72	12.53	10.55	10.52	13.69	15.56	17.15	10.39	11.88	16.21	15.53	22.05	13.46	13.61	17.55	12.46	15.68	13.09	17.14	19.02	10.48	9.03	**11.23**	**2.45**
1983	0.50	1.08	2.38	17.85	27.84	11.63	9.35	11.19	13.61	23.18	24.45	26.27	12.37	15.19	14.96	29.41	22.90	13.33	12.83	17.05	19.71	17.01	14.97	13.64	12.47	13.82	9.17	**8.27**	**3.02**	**3.47**
1984	0.32	1.56	18.68	26.23	11.61	9.49	10.50	11.50	18.33	20.08	21.95	9.99	11.58	11.03	14.84	23.13	8.51	7.91	9.14	10.05	12.07	6.76	8.84	4.34	4.95	8.98	**3.19**	**3.65**	**4.18**	**4.27**
1985	0.46	13.14	25.15	11.35	8.89	10.57	12.31	21.38	22.72	22.96	9.47	11.08	10.19	12.31	14.17	19.12	7.24	8.18	8.45	8.11	7.89	9.12	3.06	3.55	6.53	**4.66**	**4.05**	**4.64**	**4.73**	**4.44**
1986	1.10	5.94	3.60	3.94	5.41	6.74	16.20	26.47	25.63	8.40	12.27	10.72	16.40	17.81	11.77	20.01	15.77	17.15	13.88	10.36	14.33	6.14	4.92	6.40	**3.67**	**4.26**	**5.10**	**5.15**	**4.88**	**4.40**
1987	0.55	1.28	2.03	3.18	3.78	9.18	20.56	21.76	7.16	10.87	9.55	16.08	18.92	10.74	15.17	22.99	23.07	17.75	13.43	15.47	8.94	6.57	6.90	**4.63**	**4.53**	**4.96**	**5.47**	**5.26**	**4.79**	**4.29**
1988	0.56	1.68	3.31	4.73	13.59	25.47	24.89	8.03	11.96	10.23	15.70	17.97	10.84	12.88	17.97	22.78	15.82	11.70	14.32	7.35	6.57	5.21	**3.85**	**4.74**	**5.44**	**5.81**	**5.78**	**5.29**	**4.67**	**4.22**
1989	0.59	2.20	4.31	15.24	28.20	27.20	8.44	12.44	10.42	16.20	18.35	10.70	12.69	17.20	19.40	20.23	12.70	14.83	6.86	5.44	6.26	**3.62**	**5.20**	**5.91**	**6.30**	**6.13**	**5.54**	**4.93**	**4.43**	**4.10**
1990	0.60	2.37	9.91	28.82	28.84	8.44	12.84	10.50	16.95	19.36	10.90	13.33	18.65	21.46	18.68	17.05	17.44	7.75	6.05	5.89	**5.11**	**5.71**	**6.48**	**6.85**	**6.65**	**5.99**	**5.39**	**4.87**	**4.41**	**3.99**
1991	0.58	6.49	26.21	29.17	8.21	12.89	10.75	17.82	20.29	10.91	14.18	19.95	23.41	19.53	15.92	21.86	8.35	6.16	5.96	**4.45**	**5.97**	**6.69**	**7.30**	**7.18**	**6.64**	**5.90**	**5.34**	**4.96**	**4.53**	**4.25**
1992	1.06	10.87	17.97	6.98	11.78	10.35	18.59	21.73	11.38	16.25	22.80	29.36	23.16	17.77	16.46	16.00	8.17	6.20	**5.08**	**6.44**	**6.59**	**8.17**	**8.53**	**8.22**	**7.27**	**6.60**	**6.53**	**6.13**	**5.84**	**5.39**
1993	2.39	8.44	5.34	9.20	8.80	15.43	19.28	10.93	16.25	24.07	35.51	26.31	20.21	17.33	14.99	20.00	7.16	**5.96**	**6.78**	**5.77**	**7.90**	**8.86**	**8.69**	**7.65**	**6.91**	**6.56**	**6.13**	**6.26**	**5.74**	**5.07**
1994	1.61	3.42	7.24	7.63	12.89	15.87	10.07	14.94	21.29	34.42	25.93	20.33	17.01	13.70	16.03	19.01	**6.30**	**6.89**	**5.56**	**7.34**	**8.27**	**8.46**	**7.45**	**6.71**	**6.39**	**5.87**	**5.93**	**5.54**	**4.89**	**4.32**
1995	2.16	9.88	9.25	19.01	19.30	10.30	16.63	22.26	29.92	24.96	20.60	16.70	13.03	9.76	10.39	**9.75**	**7.99**	**7.23**	**9.11**	**9.83**	**9.65**	**8.61**	**7.86**	**7.76**	**7.29**	**7.14**	**6.71**	**5.94**	**5.26**	**4.68**
1996	1.09	4.43	16.13	18.64	9.72	16.55	23.19	33.59	27.06	22.28	17.68	13.53	9.63	7.30	**7.33**	**8.35**	**6.54**	**8.45**	**9.36**	**9.29**	**8.11**	**7.31**	**6.97**	**6.39**	**6.21**	**5.67**	**4.99**	**4.38**	**3.90**	**3.46**
1997	1.50	14.75	21.20	9.90	18.22	23.19	31.88	26.27	21.94	17.56	13.33	9.29	6.39	**5.89**	**9.33**	**7.84**	**10.06**	**11.06**	**10.98**	**9.68**	**8.79**	**8.65**	**8.04**	**7.66**	**6.95**	**6.03**	**5.30**	**4.74**	**4.21**	**3.51**
1998	3.23	12.15	8.23	16.52	22.51	36.72	29.11	23.86	18.21	13.72	9.65	7.44	**6.88**	**9.96**	**7.54**	**8.56**	**9.07**	**9.37**	**8.42**	**7.58**	**7.01**	**6.41**	**6.40**	**5.98**	**5.31**	**4.69**	**4.18**	**3.73**	**3.16**	**2.78**
1999	1.55	3.84	11.71	20.24	36.47	29.18	24.41	18.07	13.21	9.53	7.84	**7.21**	**10.37**	**7.91**	**9.31**	**9.11**	**9.09**	**8.24**	**7.37**	**6.79**	**6.12**	**6.01**	**5.76**	**5.14**	**4.58**	**4.08**	**3.65**	**3.11**	**2.73**	**2.44**
2000	1.15	24.19	30.46	34.86	27.55	24.06	18.48	14.04	9.07	6.39	**5.77**	**10.20**	**9.66**	**12.38**	**13.22**	**12.55**	**11.26**	**10.24**	**9.62**	**8.76**	**8.29**	**7.62**	**6.72**	**5.94**	**5.36**	**4.79**	**4.06**	**3.56**	**3.18**	**2.85**
2001	7.66	22.22	41.23	30.55	25.13	18.53	13.12	9.20	7.85	**6.78**	**10.50**	**7.97**	**10.31**	**11.84**	**12.29**	**11.13**	**9.92**	**9.15**	**8.27**	**8.14**	**7.64**	**6.86**	**6.14**	**5.51**	**4.93**	**4.21**	**3.71**	**3.32**	**2.98**	**2.67**
2002	5.98	35.83	29.14	24.84	18.24	13.76	9.70	8.71	**7.61**	**10.13**	**7.50**	**9.21**	**11.09**	**12.13**	**11.28**	**9.50**	**8.71**	**7.90**	**7.64**	**7.41**	**6.58**	**5.86**	**5.22**	**4.66**	**3.95**	**3.46**	**3.08**	**2.76**	**2.47**	**2.21**
2003	9.87	17.94	21.75	16.42	12.25	8.37	8.21	**7.61**	**8.53**	**6.82**	**7.40**	**8.26**	**8.55**	**8.34**	**7.63**	**5.86**	**4.96**	**5.21**	**5.15**	**4.59**	**4.08**	**3.65**	**3.26**	**2.75**	**2.40**	**2.14**	**1.92**	**1.72**	**1.54**	**1.38**
2004	5.11	17.69	15.47	12.06	7.83	7.39	**6.72**	**7.23**	**6.37**	**6.99**	**7.73**	**7.97**	**7.89**	**7.56**	**6.80**	**5.22**	**5.04**	**4.85**	**4.32**	**3.85**	**3.43**	**3.06**	**2.58**	**2.25**	**2.01**	**1.80**	**1.61**	**1.44**	**1.29**	**1.01**
2005	4.20	9.66	9.79	7.10	6.49	**6.44**	**8.03**	**6.82**	**7.00**	**7.44**	**7.72**	**7.59**	**7.50**	**7.41**	**6.92**	**6.40**	**6.07**	**5.45**	**4.87**	**4.36**	**3.90**	**3.33**	**2.93**	**2.62**	**2.35**	**2.10**	**1.89**	**1.70**	**1.47**	**1.26**
2006	1.56	6.91	8.10	10.54	**8.23**	**9.30**	**7.23**	**6.96**	**7.40**	**7.82**	**7.86**	**7.76**	**7.93**	**7.73**	**7.92**	**7.81**	**7.11**	**6.45**	**5.83**	**5.25**	**4.53**	**3.98**	**3.54**	**3.18**	**2.86**	**2.56**	**2.30**	**2.01**	**1.80**	**1.49**
2007	1.51	9.74	13.62	**9.06**	**10.02**	**7.33**	**7.08**	**7.67**	**8.22**	**8.34**	**8.19**	**8.47**	**8.38**	**8.53**	**8.95**	**8.34**	**7.65**	**7.02**	**6.40**	**5.58**	**4.90**	**4.37**	**3.94**	**3.54**	**3.18**	**2.85**	**2.51**	**2.25**	**1.87**	**1.68**
2008	2.14	18.43	**11.58**	**10.90**	**8.31**	**7.64**	**7.78**	**8.07**	**8.13**	**7.94**	**8.02**	**7.91**	**8.25**	**8.63**	**8.24**	**7.56**	**6.99**	**6.44**	**5.63**	**5.01**	**4.49**	**4.05**	**3.64**	**3.27**	**2.93**	**2.55**	**2.29**	**1.89**	**1.69**	**1.52**
2009	5.54	**6.99**	**9.42**	**9.86**	**8.84**	**8.82**	**8.76**	**8.57**	**8.38**	**8.24**	**8.12**	**8.25**	**8.24**	**7.83**	**7.40**	**6.67**	**6.00**	**5.19**	**4.59**	**4.13**	**3.71**	**3.33**	**2.99**	**2.69**	**2.38**	**2.14**	**1.87**	**1.68**	**1.51**	**1.36**
2010	**0.96**	**6.94**	**10.11**	**9.94**	**9.80**	**9.57**	**9.34**	**9.19**	**9.09**	**8.76**	**8.61**	**8.49**	**8.07**	**7.58**	**7.00**	**6.04**	**5.14**	**4.56**	**4.10**	**3.69**	**3.32**	**2.99**	**2.69**	**2.41**	**2.17**	**1.95**	**1.76**	**1.58**	**1.42**	**1.27**
2011	**2.55**	**9.66**	**15.55**	**18.65**	**18.34**	**17.73**	**16.71**	**16.21**	**15.63**	**15.68**	**16.14**	**15.07**	**13.94**	**12.85**	**11.49**	**8.93**	**7.80**	**6.93**	**6.20**	**5.54**	**4.96**	**4.45**	**3.99**	**3.57**	**3.20**	**2.87**	**2.58**	**2.32**	**2.08**	**1.87**
2012	**3.98**	**18.83**	**29.54**	**31.51**	**29.96**	**28.09**	**27.27**	**26.17**	**26.27**	**25.97**	**24.95**	**23.99**	**23.08**	**22.09**	**19.92**	**16.55**	**15.21**	**13.69**	**12.30**	**10.84**	**9.65**	**8.56**	**7.65**	**6.82**	**6.13**	**5.49**	**4.91**	**4.35**	**3.90**	**3.50**
2013	**4.84**	**18.92**	**24.94**	**24.94**	**23.48**	**23.27**	**22.52**	**22.28**	**22.17**	**21.01**	**19.80**	**18.99**	**17.82**	**15.79**	**14.26**	**11.99**	**10.84**	**9.73**	**8.73**	**7.83**	**7.02**	**6.28**	**5.57**	**4.99**	**4.45**	**3.79**	**3.32**	**2.96**	**2.66**	**2.39**
2014	**4.99**	**16.98**	**21.74**	**22.01**	**21.05**	**20.27**	**20.30**	**20.11**	**19.26**	**18.34**	**17.14**	**16.03**	**14.19**	**12.80**	**11.59**	**10.03**	**8.95**	**7.95**	**7.10**	**6.27**	**5.60**	**5.02**	**4.50**	**4.04**	**3.62**	**3.25**	**2.92**	**2.62**	**2.35**	**2.11**
2015	**4.87**	**16.39**	**20.40**	**21.44**	**20.28**	**20.14**	**20.03**	**19.22**	**17.91**	**16.90**	**16.14**	**14.75**	**13.58**	**12.41**	**11.25**	**9.70**	**8.66**	**7.66**	**6.87**	**6.16**	**5.52**	**4.93**	**4.37**	**3.91**	**3.49**	**3.10**	**2.80**	**2.51**	**2.26**	**2.03**
2016	**4.89**	**16.39**	**21.01**	**21.31**	**20.83**	**20.42**	**19.68**	**18.86**	**17.81**	**16.84**	**15.53**	**14.59**	**13.53**	**12.36**	**11.19**	**9.69**	**8.66**	**7.76**	**6.95**	**6.12**	**5.49**	**4.86**	**4.27**	**3.81**	**3.41**	**3.07**	**2.75**	**2.47**	**2.22**	**2.00**
2017	**4.83**	**16.07**	**20.80**	**21.72**	**20.60**	**19.39**	**18.70**	**17.96**	**17.13**	**15.42**	**14.65**	**13.94**	**12.89**	**11.78**	**10.64**	**9.05**	**7.93**	**7.06**	**6.32**	**5.67**	**5.08**	**4.56**	**4.09**	**3.65**	**3.30**	**2.96**	**2.66**	**2.39**	**2.15**	**1.93**

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
1981	0.13	1.80	5.40	8.36	11.15	13.52	15.79	17.71	18.94	19.82	20.47	20.95	21.33	21.61	21.83	21.98	22.09	22.18	22.24	22.28	22.31	22.34	22.35	22.36	22.37	22.38	22.38	22.39	22.39	**22.39**
1982	0.18	2.71	6.52	10.33	13.72	16.22	17.91	18.84	19.39	19.76	20.07	20.27	20.44	20.58	20.66	20.73	20.79	20.82	20.85	20.86	20.88	20.89	20.90	20.91	20.92	20.92	20.92	20.92	**20.92**	**20.92**
1983	0.03	0.63	2.31	4.49	7.02	9.45	11.24	12.36	13.17	13.81	14.24	14.57	14.79	14.92	15.03	15.13	15.19	15.22	15.26	15.27	15.29	15.30	15.31	15.31	15.32	15.32	15.32	**15.32**	**15.32**	**15.32**
1984	0.07	1.30	4.15	7.65	10.99	13.40	14.84	15.80	16.54	17.06	17.46	17.73	17.92	18.08	18.18	18.26	18.33	18.37	18.40	18.42	18.43	18.44	18.45	18.46	18.46	18.47	**18.48**	**18.48**	**18.48**	**18.48**
1985	0.05	1.20	4.35	8.11	10.85	12.60	13.84	14.78	15.46	15.93	16.26	16.48	16.65	16.79	16.88	16.95	17.00	17.03	17.05	17.07	17.08	17.09	17.10	17.10	17.11	**17.11**	**17.11**	**17.11**	**17.11**	**17.12**
1986	0.04	0.77	2.80	4.99	6.83	8.36	9.61	10.56	11.29	11.82	12.19	12.50	12.74	12.92	13.03	13.11	13.17	13.20	13.23	13.25	13.26	13.27	13.28	13.29	**13.30**	**13.30**	**13.30**	**13.30**	**13.30**	**13.31**
1987	0.04	0.56	1.75	3.05	4.30	5.45	6.39	7.19	7.79	8.26	8.67	9.00	9.24	9.42	9.52	9.59	9.65	9.69	9.72	9.74	9.75	9.75	9.77	**9.78**	**9.78**	**9.79**	**9.79**	**9.79**	**9.79**	**9.79**
1988	0.04	0.57	1.74	3.14	4.61	5.82	6.84	7.60	8.16	8.63	9.01	9.31	9.51	9.63	9.72	9.79	9.85	9.88	9.91	9.92	9.93	9.95	**9.97**	**9.98**	**9.99**	**9.99**	**9.99**	**10.00**	**10.00**	**10.00**
1989	0.03	0.54	1.90	3.59	5.16	6.48	7.48	8.23	8.83	9.28	9.60	9.84	9.98	10.08	10.16	10.22	10.26	10.29	10.31	10.33	10.34	**10.36**	**10.37**	**10.38**	**10.38**	**10.38**	**10.39**	**10.39**	**10.39**	**10.39**
1990	0.02	0.44	1.61	3.05	4.36	5.31	6.01	6.62	7.09	7.43	7.67	7.81	7.91	7.99	8.06	8.10	8.13	8.15	8.17	8.19	**8.21**	**8.22**	**8.22**	**8.23**	**8.23**	**8.23**	**8.24**	**8.24**	**8.24**	**8.24**
1991	0.02	0.46	1.62	2.90	3.94	4.73	5.41	5.94	6.33	6.61	6.77	6.88	6.97	7.04	7.09	7.12	7.14	7.16	7.18	**7.20**	**7.21**	**7.22**	**7.23**	**7.24**	**7.24**	**7.24**	**7.24**	**7.25**	**7.25**	**7.25**
1992	0.02	0.34	1.14	2.06	2.93	3.83	4.58	5.12	5.50	5.73	5.89	6.00	6.08	6.13	6.16	6.18	6.21	6.23	**6.25**	**6.26**	**6.27**	**6.28**	**6.28**	**6.29**	**6.29**	**6.29**	**6.29**	**6.30**	**6.30**	**6.30**
1993	0.01	0.24	0.83	1.60	2.53	3.36	3.99	4.44	4.70	4.88	5.01	5.10	5.16	5.19	5.21	5.24	5.26	**5.28**	**5.30**	**5.30**	**5.31**	**5.31**	**5.32**	**5.32**	**5.32**	**5.32**	**5.32**	**5.32**	**5.33**	**5.33**
1994	0.01	0.27	0.93	1.92	2.95	3.75	4.30	4.62	4.84	5.01	5.12	5.19	5.23	5.26	5.28	5.31	**5.34**	**5.36**	**5.38**	**5.38**	**5.39**	**5.40**	**5.40**	**5.40**	**5.40**	**5.41**	**5.41**	**5.41**	**5.41**	**5.41**
1995	0.03	0.43	1.68	3.42	4.87	5.91	6.57	7.04	7.44	7.70	7.85	7.95	8.02	8.08	8.13	**8.20**	**8.24**	**8.27**	**8.29**	**8.30**	**8.31**	**8.31**	**8.32**	**8.32**	**8.32**	**8.33**	**8.33**	**8.33**	**8.33**	**8.33**
1996	0.01	0.41	1.75	3.41	4.74	5.63	6.26	6.82	7.18	7.40	7.53	7.62	7.70	7.77	**7.85**	**7.90**	**7.94**	**7.97**	**7.99**	**8.00**	**8.01**	**8.02**	**8.02**	**8.03**	**8.03**	**8.03**	**8.03**	**8.03**	**8.04**	**8.04**
1997	0.02	0.56	1.96	3.44	4.55	5.42	6.17	6.65	6.94	7.12	7.25	7.35	7.45	**7.55**	**7.62**	**7.66**	**7.70**	**7.72**	**7.74**	**7.75**	**7.76**	**7.77**	**7.78**	**7.78**	**7.78**	**7.78**	**7.78**	**7.79**	**7.79**	**7.79**
1998	0.03	0.49	1.61	2.72	3.70	4.58	5.17	5.53	5.75	5.91	6.04	6.15	**6.29**	**6.37**	**6.43**	**6.47**	**6.50**	**6.52**	**6.53**	**6.54**	**6.55**	**6.56**	**6.56**	**6.56**	**6.56**	**6.57**	**6.57**	**6.57**	**6.57**	**6.57**
1999	0.01	0.40	1.27	2.36	3.57	4.42	4.97	5.29	5.50	5.68	5.85	**6.03**	**6.16**	**6.25**	**6.31**	**6.35**	**6.38**	**6.40**	**6.41**	**6.42**	**6.43**	**6.43**	**6.44**	**6.44**	**6.44**	**6.45**	**6.45**	**6.45**	**6.45**	**6.45**
2000	0.03	0.61	2.15	4.09	5.46	6.26	6.73	7.05	7.32	7.53	**7.77**	**7.95**	**8.07**	**8.16**	**8.22**	**8.26**	**8.29**	**8.31**	**8.32**	**8.33**	**8.34**	**8.35**	**8.35**	**8.35**	**8.35**	**8.35**	**8.36**	**8.36**	**8.36**	**8.36**
2001	0.02	0.61	2.25	3.83	4.86	5.48	5.90	6.23	6.50	**6.80**	**7.02**	**7.18**	**7.29**	**7.37**	**7.41**	**7.45**	**7.47**	**7.48**	**7.50**	**7.50**	**7.51**	**7.51**	**7.52**	**7.52**	**7.52**	**7.52**	**7.52**	**7.52**	**7.52**	**7.52**
2002	0.02	0.63	2.01	3.20	4.00	4.56	5.02	5.42	**5.88**	**6.26**	**6.56**	**6.75**	**6.87**	**6.95**	**7.01**	**7.05**	**7.08**	**7.10**	**7.11**	**7.12**	**7.13**	**7.13**	**7.14**	**7.14**	**7.14**	**7.14**	**7.15**	**7.15**	**7.15**	**7.15**
2003	0.02	0.63	1.77	2.74	3.50	4.20	4.86	**5.64**	**6.32**	**6.81**	**7.11**	**7.33**	**7.49**	**7.61**	**7.69**	**7.75**	**7.80**	**7.83**	**7.85**	**7.87**	**7.89**	**7.90**	**7.91**	**7.91**	**7.92**	**7.92**	**7.92**	**7.92**	**7.92**	**7.93**
2004	0.07	0.81	1.96	3.16	4.38	5.55	**6.86**	**8.10**	**8.96**	**9.51**	**9.92**	**10.21**	**10.42**	**10.57**	**10.68**	**10.76**	**10.82**	**10.86**	**10.89**	**10.92**	**10.94**	**10.95**	**10.96**	**10.97**	**10.97**	**10.98**	**10.98**	**10.98**	**10.99**	**10.99**
2005	0.05	0.72	2.29	4.22	6.32	**8.67**	**10.75**	**12.06**	**12.90**	**13.60**	**14.12**	**14.49**	**14.74**	**14.91**	**15.02**	**15.11**	**15.16**	**15.20**	**15.23**	**15.26**	**15.27**	**15.28**	**15.29**	**15.30**	**15.30**	**15.30**	**15.31**	**15.31**	**15.31**	**15.31**
2006	0.03	0.76	2.81	5.66	**9.15**	**12.05**	**13.79**	**14.84**	**15.74**	**16.44**	**16.96**	**17.32**	**17.56**	**17.72**	**17.83**	**17.90**	**17.94**	**17.98**	**18.00**	**18.02**	**18.03**	**18.04**	**18.04**	**18.04**	**18.05**	**18.05**	**18.05**	**18.05**	**18.05**	**18.05**
2007	0.03	0.93	3.73	**7.70**	**11.67**	**14.24**	**15.72**	**16.97**	**17.92**	**18.64**	**19.15**	**19.50**	**19.74**	**19.90**	**20.01**	**20.08**	**20.12**	**20.15**	**20.17**	**20.19**	**20.20**	**20.21**	**20.21**	**20.21**	**20.22**	**20.22**	**20.22**	**20.22**	**20.22**	**20.22**
2008	0.02	0.76	**3.34**	**7.11**	**9.81**	**11.42**	**12.77**	**13.80**	**14.57**	**15.13**	**15.53**	**15.81**	**15.99**	**16.12**	**16.21**	**16.27**	**16.30**	**16.33**	**16.35**	**16.36**	**16.37**	**16.37**	**16.37**	**16.38**	**16.38**	**16.38**	**16.38**	**16.38**	**16.38**	**16.39**
2009	0.02	**0.44**	**2.31**	**4.15**	**5.68**	**6.98**	**7.91**	**8.57**	**9.04**	**9.37**	**9.60**	**9.76**	**9.87**	**9.95**	**10.00**	**10.03**	**10.05**	**10.07**	**10.08**	**10.09**	**10.09**	**10.10**	**10.10**	**10.10**	**10.10**	**10.10**	**10.11**	**10.11**	**10.11**	**10.11**
2010	**0.01**	**0.51**	**1.71**	**3.08**	**4.43**	**5.45**	**6.16**	**6.65**	**7.00**	**7.25**	**7.43**	**7.55**	**7.64**	**7.69**	**7.73**	**7.76**	**7.78**	**7.79**	**7.80**	**7.81**	**7.81**	**7.82**	**7.82**	**7.82**	**7.82**	**7.82**	**7.83**	**7.83**	**7.83**	**7.83**
2011	**0.04**	**0.57**	**1.91**	**3.63**	**5.11**	**6.17**	**6.85**	**7.29**	**7.57**	**7.77**	**7.89**	**7.97**	**8.03**	**8.06**	**8.08**	**8.09**	**8.10**	**8.11**	**8.11**	**8.11**	**8.12**	**8.12**	**8.12**	**8.12**	**8.12**	**8.12**	**8.12**	**8.12**	**8.12**	**8.12**
2012	**0.04**	**0.64**	**2.26**	**4.02**	**5.37**	**6.22**	**6.70**	**6.98**	**7.15**	**7.26**	**7.32**	**7.36**	**7.39**	**7.40**	**7.41**	**7.41**	**7.42**	**7.42**	**7.42**	**7.42**	**7.42**	**7.42**	**7.42**	**7.42**	**7.42**	**7.42**	**7.42**	**7.42**	**7.42**	**7.42**
2013	**0.04**	**0.60**	**2.08**	**3.69**	**4.97**	**5.79**	**6.29**	**6.60**	**6.80**	**6.92**	**7.00**	**7.05**	**7.08**	**7.10**	**7.11**	**7.11**	**7.12**	**7.12**	**7.12**	**7.12**	**7.13**	**7.13**	**7.13**	**7.13**	**7.13**	**7.13**	**7.13**	**7.13**	**7.13**	**7.13**
2014	**0.04**	**0.63**	**2.25**	**4.05**	**5.51**	**6.48**	**7.08**	**7.48**	**7.73**	**7.89**	**8.00**	**8.06**	**8.10**	**8.12**	**8.14**	**8.15**	**8.15**	**8.16**	**8.16**	**8.16**	**8.17**	**8.17**	**8.17**	**8.17**	**8.17**	**8.17**	**8.17**	**8.17**	**8.17**	**8.17**
2015	**0.04**	**0.64**	**2.27**	**4.11**	**5.60**	**6.61**	**7.24**	**7.65**	**7.92**	**8.09**	**8.20**	**8.26**	**8.31**	**8.33**	**8.35**	**8.36**	**8.37**	**8.37**	**8.38**	**8.38**	**8.38**	**8.38**	**8.38**	**8.38**	**8.38**	**8.38**	**8.38**	**8.38**	**8.38**	**8.38**
2016	**0.04**	**0.66**	**2.32**	**4.18**	**5.68**	**6.71**	**7.37**	**7.79**	**8.05**	**8.22**	**8.33**	**8.39**	**8.43**	**8.46**	**8.47**	**8.49**	**8.49**	**8.50**	**8.50**	**8.50**	**8.50**	**8.51**	**8.51**	**8.51**	**8.51**	**8.51**	**8.51**	**8.51**	**8.51**	**8.51**
2017	**0.04**	**0.66**	**2.34**	**4.21**	**5.76**	**6.84**	**7.53**	**7.96**	**8.24**	**8.42**	**8.53**	**8.60**	**8.64**	**8.67**	**8.69**	**8.70**	**8.71**	**8.71**	**8.72**	**8.72**	**8.72**	**8.72**	**8.72**	**8.72**	**8.73**	**8.73**	**8.73**	**8.73**	**8.73**	**8.73**

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
1981	0.27	0.73	7.80	12.09	17.08	31.64	44.56	48.96	51.79	54.29	56.67	59.96	63.28	66.20	67.41	68.77	69.85	71.03	72.30	72.99	73.70	74.23	74.74	75.17	75.55	75.94	76.16	76.34	76.57	**76.84**
1982	0.46	19.17	27.17	36.15	53.55	63.92	67.04	68.93	70.22	71.31	72.53	73.68	74.72	75.22	75.72	76.31	76.77	77.31	77.56	77.78	78.02	78.15	78.30	78.41	78.52	78.63	78.68	78.71	**78.75**	**78.76**
1983	0.50	1.57	3.90	20.64	41.49	47.48	51.51	55.68	60.03	66.24	71.12	74.96	76.26	77.62	78.74	80.57	81.55	81.99	82.35	82.76	83.14	83.41	83.60	83.75	83.87	83.98	84.05	**84.10**	**84.12**	**84.13**
1984	0.32	1.87	19.96	39.86	45.96	50.04	53.88	57.48	62.38	66.61	70.20	71.43	72.68	73.72	74.94	76.53	76.97	77.34	77.74	78.12	78.54	78.75	78.99	79.11	79.23	79.43	**79.50**	**79.57**	**79.66**	**79.74**
1985	0.46	13.54	34.98	41.87	46.31	50.84	55.34	61.93	67.22	71.20	72.42	73.67	74.68	75.74	76.80	78.01	78.37	78.75	79.11	79.42	79.70	79.99	80.08	80.18	80.36	**80.48**	**80.57**	**80.68**	**80.79**	**80.88**
1986	1.10	6.97	10.29	13.72	18.12	23.17	34.27	49.12	59.45	61.91	65.14	67.57	70.83	73.76	75.33	77.66	79.11	80.44	81.32	81.88	82.58	82.84	83.03	83.26	**83.39**	**83.53**	**83.69**	**83.85**	**83.99**	**84.11**
1987	0.55	1.83	3.81	6.82	10.22	18.07	33.79	46.81	50.10	54.68	58.22	63.54	68.74	71.10	74.06	77.83	80.73	82.44	83.50	84.55	85.06	85.40	85.73	**85.94**	**86.14**	**86.34**	**86.55**	**86.74**	**86.91**	**87.05**
1988	0.56	2.24	5.45	9.85	21.67	40.45	53.82	56.98	61.22	64.35	68.59	72.61	74.57	76.62	79.10	81.64	83.00	83.84	84.74	85.13	85.45	85.70	**85.86**	**86.06**	**86.28**	**86.49**	**86.70**	**86.87**	**87.02**	**87.14**
1989	0.59	2.78	6.95	20.84	42.15	56.48	59.60	63.70	66.62	70.60	74.29	76.02	77.81	79.91	81.85	83.47	84.27	85.08	85.40	85.63	85.88	**86.02**	**86.21**	**86.41**	**86.61**	**86.80**	**86.95**	**87.09**	**87.20**	**87.30**
1990	0.60	2.96	12.54	37.28	54.49	57.96	62.67	65.96	70.61	74.93	76.85	78.91	81.39	83.69	85.24	86.38	87.35	87.70	87.95	88.18	**88.36**	**88.56**	**88.77**	**88.97**	**89.16**	**89.32**	**89.45**	**89.56**	**89.66**	**89.74**
1991	0.58	7.03	31.27	50.85	54.64	59.98	63.78	69.27	74.30	76.41	78.82	81.69	84.37	86.06	87.16	88.42	88.79	89.04	89.27	**89.43**	**89.63**	**89.84**	**90.05**	**90.25**	**90.41**	**90.55**	**90.67**	**90.77**	**90.86**	**90.94**
1992	1.06	11.81	27.60	32.57	40.27	46.16	55.45	64.14	67.64	72.00	77.08	82.08	84.84	86.45	87.68	88.66	89.08	89.37	**89.60**	**89.87**	**90.12**	**90.42**	**90.70**	**90.95**	**91.15**	**91.32**	**91.47**	**91.61**	**91.73**	**91.84**
1993	2.39	10.63	15.38	23.09	29.72	40.17	51.06	55.98	62.41	70.33	79.13	83.30	85.65	87.24	88.37	89.66	90.02	**90.30**	**90.60**	**90.84**	**91.14**	**91.46**	**91.74**	**91.96**	**92.15**	**92.32**	**92.46**	**92.60**	**92.72**	**92.82**
1994	1.61	4.97	11.83	18.49	28.75	39.59	45.30	52.83	61.89	73.34	78.96	82.19	84.34	85.77	87.21	88.63	**89.01**	**89.40**	**89.69**	**90.06**	**90.43**	**90.79**	**91.07**	**91.31**	**91.52**	**91.70**	**91.87**	**92.02**	**92.15**	**92.25**
1995	2.16	11.83	19.94	34.84	46.76	51.74	58.78	66.49	74.41	78.94	81.70	83.44	84.56	85.29	85.98	**86.55**	**86.97**	**87.32**	**87.72**	**88.11**	**88.46**	**88.74**	**88.97**	**89.18**	**89.36**	**89.53**	**89.67**	**89.79**	**89.89**	**89.97**
1996	1.09	5.47	20.65	35.11	41.09	50.05	60.33	71.55	77.40	80.84	82.92	84.21	85.00	85.53	**86.02**	**86.53**	**86.90**	**87.33**	**87.77**	**88.17**	**88.48**	**88.73**	**88.96**	**89.15**	**89.33**	**89.48**	**89.60**	**89.71**	**89.79**	**89.87**
1997	1.50	16.02	33.71	40.08	50.37	60.82	71.58	77.43	80.92	83.05	84.36	85.14	85.62	**86.03**	**86.63**	**87.08**	**87.61**	**88.13**	**88.58**	**88.94**	**89.23**	**89.49**	**89.71**	**89.90**	**90.06**	**90.19**	**90.30**	**90.39**	**90.47**	**90.53**
1998	3.23	14.99	21.94	34.57	48.69	66.17	74.69	79.50	82.22	83.87	84.86	85.54	**86.11**	**86.87**	**87.38**	**87.91**	**88.42**	**88.89**	**89.28**	**89.60**	**89.87**	**90.10**	**90.31**	**90.50**	**90.65**	**90.78**	**90.90**	**90.99**	**91.07**	**91.13**
1999	1.55	5.33	16.37	33.04	56.60	68.22	74.90	78.54	80.67	81.99	82.96	**83.76**	**84.82**	**85.54**	**86.30**	**86.97**	**87.58**	**88.08**	**88.49**	**88.83**	**89.12**	**89.39**	**89.63**	**89.83**	**90.00**	**90.15**	**90.27**	**90.37**	**90.46**	**90.54**
2000	1.15	25.06	47.70	65.18	73.65	78.68	81.46	83.12	84.01	84.56	**85.02**	**85.75**	**86.36**	**87.05**	**87.68**	**88.20**	**88.60**	**88.92**	**89.18**	**89.40**	**89.59**	**89.75**	**89.87**	**89.98**	**90.07**	**90.15**	**90.21**	**90.26**	**90.30**	**90.34**
2001	7.66	28.18	57.54	69.82	76.45	79.91	81.83	82.96	83.81	**84.46**	**85.38**	**85.99**	**86.69**	**87.40**	**88.05**	**88.55**	**88.95**	**89.28**	**89.54**	**89.78**	**89.99**	**90.16**	**90.31**	**90.43**	**90.53**	**90.61**	**90.68**	**90.74**	**90.79**	**90.84**
2002	5.98	39.65	57.06	67.22	72.62	75.84	77.74	79.24	**80.41**	**81.80**	**82.69**	**83.68**	**84.74**	**85.76**	**86.58**	**87.19**	**87.69**	**88.10**	**88.47**	**88.80**	**89.07**	**89.29**	**89.48**	**89.63**	**89.76**	**89.87**	**89.96**	**90.04**	**90.11**	**90.17**
2003	9.87	26.04	41.99	51.22	56.86	60.18	63.10	**65.54**	**68.00**	**69.75**	**71.49**	**73.25**	**74.91**	**76.38**	**77.60**	**78.46**	**79.15**	**79.83**	**80.46**	**81.00**	**81.46**	**81.84**	**82.18**	**82.45**	**82.68**	**82.89**	**83.06**	**83.22**	**83.35**	**83.47**
2004	5.11	21.88	33.84	41.59	45.91	49.58	**52.60**	**55.53**	**57.85**	**60.17**	**62.51**	**64.71**	**66.69**	**68.42**	**69.85**	**70.86**	**71.79**	**72.63**	**73.34**	**73.95**	**74.47**	**74.92**	**75.28**	**75.59**	**75.86**	**76.10**	**76.31**	**76.49**	**76.65**	**76.78**
2005	4.20	13.45	21.85	27.24	31.69	**35.69**	**40.15**	**43.50**	**46.61**	**49.62**	**52.46**	**55.00**	**57.29**	**59.36**	**61.14**	**62.67**	**64.02**	**65.15**	**66.11**	**66.92**	**67.62**	**68.19**	**68.67**	**69.09**	**69.46**	**69.78**	**70.06**	**70.31**	**70.52**	**70.70**
2006	1.56	8.36	15.72	24.31	**30.07**	**35.73**	**39.50**	**42.76**	**45.89**	**48.89**	**51.61**	**54.05**	**56.32**	**58.34**	**60.24**	**61.95**	**63.38**	**64.59**	**65.61**	**66.47**	**67.17**	**67.76**	**68.26**	**68.70**	**69.07**	**69.40**	**69.69**	**69.94**	**70.15**	**70.33**
2007	1.51	11.11	23.09	**29.72**	**35.99**	**39.83**	**43.08**	**46.24**	**49.27**	**52.00**	**54.41**	**56.65**	**58.65**	**60.49**	**62.24**	**63.72**	**64.96**	**66.01**	**66.90**	**67.62**	**68.21**	**68.72**	**69.16**	**69.53**	**69.86**	**70.14**	**70.39**	**70.60**	**70.77**	**70.92**
2008	2.14	20.17	**29.33**	**36.67**	**41.34**	**45.07**	**48.46**	**51.58**	**54.40**	**56.86**	**59.11**	**61.11**	**63.02**	**64.83**	**66.40**	**67.72**	**68.83**	**69.79**	**70.57**	**71.23**	**71.79**	**72.27**	**72.68**	**73.04**	**73.35**	**73.61**	**73.84**	**74.02**	**74.19**	**74.33**
2009	5.54	**12.14**	**20.38**	**28.00**	**34.00**	**39.32**	**44.02**	**48.14**	**51.77**	**55.00**	**57.89**	**60.57**	**63.02**	**65.14**	**66.98**	**68.52**	**69.80**	**70.85**	**71.73**	**72.48**	**73.12**	**73.68**	**74.17**	**74.59**	**74.96**	**75.28**	**75.55**	**75.79**	**76.00**	**76.19**
2010	**0.96**	**7.83**	**17.10**	**25.17**	**32.20**	**38.27**	**43.52**	**48.15**	**52.26**	**55.83**	**59.01**	**61.86**	**64.32**	**66.45**	**68.26**	**69.71**	**70.87**	**71.84**	**72.68**	**73.40**	**74.02**	**74.57**	**75.04**	**75.45**	**75.82**	**76.13**	**76.42**	**76.66**	**76.88**	**77.08**
2011	**2.55**	**11.96**	**25.57**	**39.09**	**49.60**	**57.63**	**63.68**	**68.46**	**72.25**	**75.41**	**78.13**	**80.23**	**81.88**	**83.17**	**84.18**	**84.87**	**85.42**	**85.87**	**86.24**	**86.56**	**86.82**	**87.05**	**87.24**	**87.40**	**87.55**	**87.67**	**87.78**	**87.88**	**87.96**	**88.03**
2012	**3.98**	**22.05**	**44.89**	**61.54**	**71.86**	**78.25**	**82.49**	**85.32**	**87.34**	**88.77**	**89.76**	**90.46**	**90.96**	**91.33**	**91.58**	**91.75**	**91.88**	**91.97**	**92.05**	**92.11**	**92.15**	**92.19**	**92.22**	**92.24**	**92.26**	**92.28**	**92.30**	**92.31**	**92.32**	**92.33**
2013	**4.84**	**22.83**	**41.93**	**55.89**	**65.38**	**72.28**	**77.22**	**80.89**	**83.66**	**85.67**	**87.13**	**88.25**	**89.09**	**89.69**	**90.15**	**90.48**	**90.74**	**90.95**	**91.12**	**91.25**	**91.37**	**91.46**	**91.54**	**91.61**	**91.66**	**91.71**	**91.75**	**91.78**	**91.81**	**91.84**
2014	**4.99**	**21.12**	**38.13**	**51.25**	**60.66**	**67.52**	**72.80**	**76.84**	**79.86**	**82.14**	**83.85**	**85.15**	**86.12**	**86.86**	**87.44**	**87.88**	**88.24**	**88.52**	**88.76**	**88.95**	**89.11**	**89.25**	**89.37**	**89.47**	**89.55**	**89.63**	**89.69**	**89.75**	**89.80**	**89.84**
2015	**4.87**	**20.46**	**36.56**	**49.67**	**59.04**	**66.16**	**71.62**	**75.68**	**78.67**	**80.93**	**82.70**	**84.05**	**85.09**	**85.91**	**86.56**	**87.05**	**87.45**	**87.77**	**88.03**	**88.26**	**88.44**	**88.60**	**88.73**	**88.84**	**88.94**	**89.02**	**89.10**	**89.16**	**89.21**	**89.26**
2016	**4.89**	**20.47**	**37.04**	**49.96**	**59.51**	**66.62**	**71.87**	**75.78**	**78.71**	**80.94**	**82.62**	**83.94**	**84.98**	**85.80**	**86.44**	**86.93**	**87.33**	**87.65**	**87.92**	**88.14**	**88.32**	**88.48**	**88.61**	**88.72**	**88.81**	**88.89**	**88.97**	**89.03**	**89.08**	**89.13**
2017	**4.83**	**20.12**	**36.60**	**49.86**	**59.32**	**66.09**	**71.15**	**74.98**	**77.90**	**80.04**	**81.73**	**83.09**	**84.16**	**85.01**	**85.68**	**86.19**	**86.60**	**86.93**	**87.20**	**87.43**	**87.63**	**87.80**	**87.94**	**88.06**	**88.17**	**88.26**	**88.34**	**88.41**	**88.47**	**88.52**

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
1981	0.13	1.67	3.69	3.42	3.51	3.32	4.15	4.86	3.69	3.01	2.54	2.10	1.98	1.88	1.81	1.34	1.22	1.17	0.83	0.81	0.62	0.58	0.51	0.30	0.38	0.33	0.26	0.17	0.24	**0.31**
1982	0.17	2.56	4.89	5.78	6.36	7.72	8.57	6.30	4.53	3.69	3.52	2.80	2.93	2.88	1.90	2.05	2.03	1.46	1.17	1.03	1.27	1.24	1.05	1.15	0.54	0.33	0.20	0.45	**0.00**	**0.01**
1983	0.03	0.64	1.82	2.44	3.58	5.12	4.53	3.31	2.84	2.66	2.44	2.57	2.40	1.76	1.78	1.76	1.41	1.16	1.09	0.71	0.79	0.79	0.53	0.52	0.34	0.42	0.21	**0.40**	**0.02**	**0.01**
1984	0.07	1.30	3.10	4.87	6.76	6.01	4.25	3.37	3.05	2.72	2.75	2.41	2.01	1.85	1.44	1.35	1.19	0.90	0.65	0.56	0.43	0.27	0.32	0.23	0.18	0.23	**0.57**	**0.02**	**0.01**	**0.01**
1985	0.05	1.24	3.90	6.59	5.87	4.40	3.71	3.32	3.20	3.04	2.86	2.13	2.06	1.82	1.29	1.41	0.88	0.69	0.54	0.40	0.33	0.28	0.18	0.27	0.21	**0.19**	**0.01**	**0.01**	**0.01**	**0.01**
1986	0.04	0.80	2.38	2.70	2.44	2.19	1.96	1.85	1.98	2.02	1.61	1.52	1.35	1.20	0.95	0.77	0.61	0.51	0.48	0.33	0.25	0.26	0.20	0.24	**0.23**	**0.07**	**0.05**	**0.04**	**0.04**	**0.03**
1987	0.04	0.57	1.29	1.45	1.45	1.42	1.32	1.44	1.44	1.23	1.23	1.10	1.01	0.91	0.55	0.49	0.49	0.49	0.35	0.25	0.20	0.17	0.28	**0.22**	**0.11**	**0.08**	**0.06**	**0.06**	**0.05**	**0.04**
1988	0.04	0.51	1.18	1.50	1.71	1.71	2.02	2.11	1.72	1.69	1.53	1.46	1.24	0.83	0.74	0.70	0.68	0.53	0.41	0.29	0.30	0.33	**0.62**	**0.20**	**0.13**	**0.10**	**0.09**	**0.07**	**0.06**	**0.04**
1989	0.03	0.48	1.37	1.85	2.10	2.60	2.81	2.37	2.23	1.91	1.72	1.54	1.03	0.90	0.84	0.79	0.67	0.55	0.43	0.38	0.43	**0.46**	**0.25**	**0.17**	**0.13**	**0.11**	**0.09**	**0.07**	**0.06**	**0.04**
1990	0.02	0.41	1.22	1.71	2.26	2.39	1.97	2.02	1.77	1.60	1.42	0.97	0.80	0.84	0.80	0.59	0.57	0.54	0.51	0.42	**0.52**	**0.28**	**0.21**	**0.16**	**0.14**	**0.11**	**0.09**	**0.07**	**0.06**	**0.04**
1991	0.02	0.45	1.30	2.01	2.42	2.01	2.03	1.83	1.63	1.52	1.00	0.88	0.82	0.85	0.80	0.61	0.46	0.60	0.53	**0.52**	**0.44**	**0.31**	**0.24**	**0.19**	**0.15**	**0.12**	**0.09**	**0.07**	**0.06**	**0.04**
1992	0.02	0.36	1.00	1.46	1.39	1.61	1.52	1.43	1.31	0.96	0.83	0.73	0.77	0.69	0.58	0.48	0.56	0.50	**0.53**	**0.35**	**0.27**	**0.21**	**0.17**	**0.13**	**0.11**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**
1993	0.01	0.26	0.71	0.97	1.24	1.29	1.23	1.13	0.79	0.70	0.69	0.80	0.70	0.58	0.42	0.46	0.45	**0.74**	**0.33**	**0.28**	**0.20**	**0.15**	**0.12**	**0.10**	**0.08**	**0.06**	**0.05**	**0.04**	**0.03**	**0.03**
1994	0.01	0.25	0.71	1.15	1.38	1.37	1.18	0.82	0.72	0.72	0.82	0.72	0.58	0.51	0.47	0.54	**0.55**	**0.50**	**0.38**	**0.26**	**0.20**	**0.15**	**0.12**	**0.09**	**0.07**	**0.06**	**0.04**	**0.03**	**0.03**	**0.02**
1995	0.02	0.37	1.29	2.04	2.23	2.18	1.65	1.42	1.60	1.61	1.36	1.15	1.04	0.96	1.01	**1.38**	**0.74**	**0.56**	**0.42**	**0.32**	**0.25**	**0.20**	**0.15**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.03**
1996	0.01	0.38	1.34	1.97	2.05	1.63	1.42	1.67	1.82	1.60	1.28	1.12	1.03	1.09	**1.34**	**0.87**	**0.68**	**0.48**	**0.37**	**0.29**	**0.23**	**0.19**	**0.15**	**0.11**	**0.08**	**0.07**	**0.05**	**0.04**	**0.03**	**0.03**
1997	0.02	0.50	1.50	2.08	1.81	1.79	2.11	2.22	2.01	1.62	1.39	1.36	1.31	**1.60**	**0.96**	**0.78**	**0.58**	**0.45**	**0.36**	**0.30**	**0.24**	**0.19**	**0.15**	**0.11**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.03**
1998	0.01	0.41	1.25	1.40	1.53	1.85	2.10	1.95	1.69	1.40	1.32	1.38	**1.75**	**1.10**	**0.92**	**0.64**	**0.48**	**0.37**	**0.30**	**0.24**	**0.18**	**0.14**	**0.11**	**0.08**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**
1999	0.01	0.44	1.06	1.51	2.16	2.46	2.29	1.84	1.56	1.51	1.55	**1.88**	**1.38**	**1.13**	**0.78**	**0.59**	**0.45**	**0.36**	**0.29**	**0.22**	**0.17**	**0.13**	**0.10**	**0.08**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**
2000	0.03	0.61	2.15	4.05	4.79	4.19	3.41	2.86	2.84	2.53	**3.18**	**2.52**	**2.02**	**1.57**	**1.22**	**0.94**	**0.77**	**0.62**	**0.48**	**0.38**	**0.29**	**0.22**	**0.18**	**0.13**	**0.10**	**0.08**	**0.06**	**0.04**	**0.03**	**0.02**
2001	0.02	0.73	2.50	4.22	4.22	3.52	2.98	2.84	2.57	**3.20**	**2.63**	**2.31**	**1.71**	**1.28**	**0.96**	**0.75**	**0.60**	**0.46**	**0.36**	**0.27**	**0.22**	**0.17**	**0.13**	**0.10**	**0.08**	**0.06**	**0.04**	**0.03**	**0.03**	**0.02**
2002	0.02	0.74	2.60	3.32	3.04	2.66	2.46	2.48	**3.22**	**3.05**	**2.68**	**1.92**	**1.45**	**1.09**	**0.84**	**0.66**	**0.51**	**0.40**	**0.30**	**0.24**	**0.19**	**0.15**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**
2003	0.03	0.85	1.94	2.16	2.01	2.05	2.18	**2.86**	**2.81**	**2.25**	**1.57**	**1.34**	**1.09**	**0.85**	**0.66**	**0.52**	**0.41**	**0.32**	**0.26**	**0.20**	**0.16**	**0.12**	**0.09**	**0.07**	**0.06**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**
2004	0.07	0.87	1.68	2.08	2.41	2.53	**3.26**	**3.56**	**2.78**	**2.00**	**1.67**	**1.36**	**1.07**	**0.83**	**0.64**	**0.50**	**0.40**	**0.31**	**0.25**	**0.20**	**0.15**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**
2005	0.05	0.69	1.86	2.56	3.07	**3.81**	**3.55**	**2.43**	**1.69**	**1.67**	**1.42**	**1.12**	**0.84**	**0.61**	**0.46**	**0.34**	**0.26**	**0.20**	**0.15**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**
2006	0.02	0.69	2.26	3.51	**5.04**	**4.68**	**3.18**	**2.09**	**2.09**	**1.83**	**1.49**	**1.15**	**0.85**	**0.61**	**0.44**	**0.32**	**0.24**	**0.18**	**0.13**	**0.10**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**
2007	0.02	0.90	3.14	**5.40**	**6.25**	**4.75**	**3.06**	**2.98**	**2.59**	**2.17**	**1.75**	**1.34**	**1.00**	**0.73**	**0.53**	**0.40**	**0.29**	**0.21**	**0.15**	**0.11**	**0.08**	**0.06**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**
2008	0.02	0.73	**3.17**	**5.45**	**4.61**	**3.14**	**3.05**	**2.66**	**2.23**	**1.82**	**1.44**	**1.11**	**0.82**	**0.62**	**0.46**	**0.34**	**0.24**	**0.17**	**0.12**	**0.09**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**
2009	0.02	**0.39**	**1.85**	**2.10**	**1.91**	**1.93**	**1.60**	**1.31**	**1.05**	**0.84**	**0.66**	**0.51**	**0.39**	**0.30**	**0.21**	**0.15**	**0.11**	**0.08**	**0.06**	**0.04**	**0.03**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
2010	**0.01**	**0.41**	**1.14**	**1.53**	**1.75**	**1.51**	**1.22**	**0.97**	**0.76**	**0.61**	**0.49**	**0.38**	**0.28**	**0.21**	**0.15**	**0.11**	**0.09**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
2011	**0.03**	**0.45**	**1.40**	**2.28**	**2.52**	**2.30**	**1.87**	**1.48**	**1.20**	**0.96**	**0.77**	**0.59**	**0.44**	**0.32**	**0.23**	**0.18**	**0.13**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
2012	**0.03**	**0.56**	**2.02**	**3.31**	**3.96**	**3.78**	**3.15**	**2.66**	**2.24**	**1.91**	**1.58**	**1.24**	**0.93**	**0.67**	**0.49**	**0.35**	**0.25**	**0.19**	**0.14**	**0.10**	**0.08**	**0.06**	**0.04**	**0.03**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**
2013	**0.03**	**0.55**	**1.91**	**2.93**	**3.21**	**2.84**	**2.33**	**1.90**	**1.60**	**1.34**	**1.08**	**0.80**	**0.59**	**0.44**	**0.31**	**0.22**	**0.17**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
2014	**0.03**	**0.61**	**2.08**	**3.08**	**3.31**	**2.94**	**2.37**	**2.01**	**1.67**	**1.35**	**1.05**	**0.78**	**0.58**	**0.42**	**0.30**	**0.22**	**0.17**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
2015	**0.03**	**0.62**	**2.09**	**3.05**	**3.29**	**2.90**	**2.39**	**1.98**	**1.64**	**1.32**	**1.01**	**0.76**	**0.54**	**0.39**	**0.29**	**0.22**	**0.16**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
2016	**0.03**	**0.63**	**2.11**	**3.11**	**3.30**	**3.02**	**2.52**	**2.04**	**1.63**	**1.29**	**0.99**	**0.71**	**0.51**	**0.38**	**0.28**	**0.21**	**0.15**	**0.12**	**0.09**	**0.06**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
2017	**0.03**	**0.63**	**2.12**	**3.12**	**3.47**	**3.19**	**2.60**	**2.08**	**1.65**	**1.32**	**0.97**	**0.68**	**0.50**	**0.38**	**0.28**	**0.21**	**0.16**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**

Conditional Prepayment Rates Fixed Rate 30 Year Mortgages by Credit Subsidy Endorsement Cohort

Book\Policy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1981	0.27	0.46	7.26	4.95	6.27	20.33	23.62	11.12	8.47	8.56	9.18	14.45	17.46	19.03	9.89	11.88	11.69	14.63	18.79	12.57	14.99	13.28	14.78	14.84	15.67	18.36	13.06	12.77	17.85	**25.73**
1982	0.46	18.89	10.26	13.59	32.63	31.92	15.88	12.65	10.64	10.64	13.56	15.81	17.57	10.53	11.94	12.75	15.46	22.06	13.47	13.61	17.55	12.46	15.68	13.09	17.14	19.02	10.48	9.03	**11.23**	**2.45**
1983	0.52	1.07	2.39	18.52	28.56	11.84	9.46	11.33	13.88	23.47	24.80	27.21	12.33	15.04	14.06	17.03	22.69	13.33	12.83	17.05	19.71	17.01	14.97	13.64	12.47	13.82	9.17	**8.27**	**3.02**	**3.47**
1984	0.32	1.56	19.17	26.65	11.83	9.68	10.66	11.60	18.21	20.17	22.44	10.01	11.59	10.55	12.58	13.93	8.44	7.88	9.14	10.05	12.08	6.76	8.84	4.33	4.94	8.98	**3.19**	**3.65**	**4.18**	**4.27**
1985	0.46	13.29	25.38	11.59	9.07	10.78	12.47	21.42	22.91	23.64	9.50	11.26	9.97	12.02	12.89	7.40	7.09	8.16	8.43	8.07	7.85	9.12	3.06	3.52	6.55	**4.64**	**4.05**	**4.64**	**4.73**	**4.44**
1986	1.11	5.94	3.50	3.82	5.28	6.58	16.12	26.88	26.16	8.28	12.24	10.55	16.56	18.01	10.00	11.51	15.78	17.16	13.91	10.39	14.35	6.08	4.84	6.36	**3.64**	**4.28**	**5.14**	**5.12**	**4.78**	**4.31**
1987	0.51	1.13	1.88	3.02	3.60	9.11	20.73	21.85	6.98	10.77	9.37	16.08	18.83	10.06	12.93	18.31	22.83	17.65	13.39	15.39	8.77	6.47	6.77	**4.55**	**4.54**	**4.99**	**5.44**	**5.15**	**4.62**	**4.17**
1988	0.42	1.38	3.01	4.45	13.66	26.16	25.61	8.02	12.12	10.22	15.94	18.37	10.55	12.20	16.47	18.98	15.92	11.70	14.39	7.23	6.53	5.00	**3.79**	**4.78**	**5.56**	**5.66**	**5.34**	**4.78**	**4.32**	**3.89**
1989	0.35	1.82	4.08	15.24	28.63	27.59	8.37	12.49	10.42	16.36	18.60	10.65	12.57	17.17	19.05	16.68	12.76	14.94	6.78	5.36	6.03	**3.60**	**5.24**	**5.98**	**6.23**	**5.89**	**5.29**	**4.76**	**4.27**	**3.86**
1990	0.39	1.83	9.38	28.95	29.03	8.32	12.75	10.39	16.99	19.54	10.80	13.26	18.74	21.54	17.88	13.56	17.44	7.75	6.02	5.79	**4.97**	**5.72**	**6.48**	**6.78**	**6.52**	**5.83**	**5.29**	**4.77**	**4.28**	**3.86**
1991	0.44	5.66	26.64	30.01	8.10	12.86	10.55	17.91	20.50	10.65	13.85	20.00	23.65	19.51	14.66	17.51	8.04	6.04	5.86	**4.43**	**6.03**	**6.78**	**7.20**	**6.90**	**6.23**	**5.61**	**5.07**	**4.56**	**4.10**	**3.81**
1992	0.73	10.00	18.94	6.59	11.15	9.74	18.38	22.19	10.84	15.46	22.93	30.41	23.92	17.73	14.73	10.35	7.63	6.34	**5.13**	**6.83**	**6.96**	**7.98**	**7.76**	**6.98**	**6.30**	**5.69**	**5.16**	**4.65**	**4.32**	**3.93**
1993	1.36	5.84	4.46	7.92	8.01	14.26	18.59	10.33	15.26	23.60	36.50	27.36	20.66	15.71	11.57	8.76	7.25	**6.17**	**7.23**	**5.54**	**6.95**	**7.58**	**7.17**	**6.49**	**5.86**	**5.30**	**4.77**	**5.01**	**4.51**	**4.05**
1994	0.63	2.20	5.91	6.38	11.60	14.96	9.44	13.90	21.05	35.87	27.26	21.31	16.02	11.74	9.10	7.33	**6.31**	**7.19**	**5.17**	**5.87**	**6.33**	**6.43**	**5.81**	**5.26**	**4.77**	**4.29**	**4.40**	**4.12**	**3.70**	**3.32**
1995	2.07	9.51	7.39	16.97	19.12	9.57	15.13	22.15	31.39	25.99	21.18	16.53	12.07	8.26	5.59	**5.68**	**8.48**	**7.54**	**8.90**	**9.09**	**8.41**	**7.72**	**6.97**	**6.37**	**5.75**	**5.58**	**5.18**	**4.66**	**4.19**	**3.79**
1996	0.75	3.01	11.07	15.73	8.56	14.65	22.69	34.21	27.40	22.54	17.26	12.77	8.77	6.32	**5.62**	**7.75**	**6.22**	**7.44**	**7.97**	**7.60**	**6.89**	**6.21**	**5.62**	**5.07**	**5.01**	**4.61**	**4.16**	**3.73**	**3.38**	**3.04**
1997	1.02	10.69	17.09	7.82	14.80	22.80	33.16	26.95	22.29	16.98	12.14	8.53	6.00	**5.37**	**8.99**	**7.74**	**9.37**	**9.76**	**9.07**	**8.29**	**7.52**	**6.91**	**6.28**	**6.01**	**5.47**	**4.89**	**4.40**	**4.04**	**3.66**	**3.15**
1998	1.61	6.92	5.99	12.45	20.53	36.13	28.86	23.66	17.63	12.79	8.97	7.08	**6.39**	**8.96**	**6.16**	**7.33**	**8.10**	**8.30**	**7.58**	**6.85**	**6.22**	**5.65**	**5.72**	**5.38**	**4.83**	**4.31**	**3.88**	**3.49**	**2.99**	**2.65**
1999	0.91	3.08	10.51	19.18	35.15	28.53	24.18	17.73	12.85	9.05	7.44	**6.70**	**9.22**	**6.38**	**7.22**	**8.00**	**8.29**	**7.62**	**6.86**	**6.29**	**5.69**	**5.64**	**5.38**	**4.84**	**4.33**	**3.88**	**3.48**	**2.99**	**2.64**	**2.37**
2000	1.02	23.60	30.85	35.67	28.01	23.92	17.59	12.61	8.31	6.27	**5.58**	**10.19**	**9.49**	**11.59**	**12.16**	**11.52**	**10.47**	**9.51**	**8.64**	**7.80**	**7.41**	**6.87**	**6.14**	**5.50**	**5.02**	**4.53**	**3.89**	**3.43**	**3.07**	**2.75**
2001	7.54	20.17	39.91	29.81	24.35	17.87	12.44	8.82	7.78	**6.66**	**10.30**	**7.49**	**9.29**	**10.49**	**10.97**	**10.38**	**9.46**	**8.70**	**7.88**	**7.79**	**7.31**	**6.58**	**5.91**	**5.32**	**4.78**	**4.11**	**3.63**	**3.25**	**2.92**	**2.62**
2002	4.18	33.79	28.94	23.99	16.92	12.27	9.05	8.73	**7.50**	**9.82**	**6.67**	**7.33**	**8.43**	**9.35**	**9.00**	**8.28**	**7.80**	**7.12**	**6.97**	**6.75**	**6.06**	**5.44**	**4.88**	**4.37**	**3.75**	**3.30**	**2.95**	**2.65**	**2.38**	**2.13**
2003	6.97	15.81	20.40	14.99	11.03	7.72	7.78	**7.27**	**7.45**	**5.75**	**5.33**	**5.30**	**5.34**	**5.18**	**4.88**	**4.53**	**4.13**	**4.28**	**4.26**	**3.84**	**3.45**	**3.11**	**2.79**	**2.40**	**2.11**	**1.89**	**1.70**	**1.53**	**1.37**	**1.23**
2004	3.96	16.19	13.66	10.33	7.08	7.70	**6.61**	**6.26**	**5.30**	**4.97**	**5.04**	**5.03**	**4.91**	**4.69**	**4.43**	**4.07**	**4.08**	**3.99**	**3.60**	**3.24**	**2.92**	**2.62**	**2.25**	**1.98**	**1.78**	**1.59**	**1.43**	**1.28**	**1.15**	**0.93**
2005	3.24	7.88	8.20	6.08	6.50	**6.54**	**7.83**	**6.52**	**5.95**	**5.88**	**6.03**	**5.97**	**5.87**	**5.73**	**5.40**	**5.44**	**5.34**	**4.87**	**4.41**	**3.98**	**3.59**	**3.11**	**2.76**	**2.47**	**2.23**	**2.00**	**1.80**	**1.62**	**1.41**	**1.21**
2006	1.24	6.45	7.90	10.67	**8.35**	**9.26**	**7.10**	**6.51**	**6.74**	**7.14**	**7.23**	**7.12**	**7.26**	**7.07**	**7.26**	**7.43**	**6.86**	**6.25**	**5.67**	**5.12**	**4.45**	**3.91**	**3.48**	**3.13**	**2.81**	**2.52**	**2.27**	**1.98**	**1.78**	**1.47**
2007	1.35	9.36	13.51	**9.04**	**10.07**	**7.32**	**6.86**	**7.30**	**7.81**	**7.96**	**7.80**	**8.08**	**8.00**	**8.12**	**8.58**	**8.14**	**7.52**	**6.91**	**6.31**	**5.51**	**4.85**	**4.33**	**3.90**	**3.51**	**3.15**	**2.83**	**2.49**	**2.23**	**1.86**	**1.67**
2008	2.03	18.21	**11.71**	**11.12**	**8.43**	**7.49**	**7.43**	**7.68**	**7.76**	**7.55**	**7.61**	**7.46**	**7.73**	**8.12**	**7.80**	**7.32**	**6.85**	**6.33**	**5.55**	**4.95**	**4.44**	**4.01**	**3.60**	**3.24**	**2.91**	**2.53**	**2.27**	**1.87**	**1.68**	**1.51**
2009	6.17	**7.22**	**9.66**	**10.07**	**8.44**	**8.11**	**7.99**	**7.78**	**7.55**	**7.37**	**7.22**	**7.27**	**7.23**	**6.87**	**6.51**	**6.08**	**5.58**	**4.87**	**4.33**	**3.90**	**3.51**	**3.16**	**2.85**	**2.56**	**2.27**	**2.04**	**1.79**	**1.61**	**1.45**	**1.30**
2010	**0.87**	**6.74**	**10.14**	**9.66**	**9.36**	**9.09**	**8.85**	**8.69**	**8.54**	**8.17**	**7.95**	**7.78**	**7.36**	**6.87**	**6.31**	**5.71**	**4.96**	**4.41**	**3.98**	**3.58**	**3.23**	**2.91**	**2.62**	**2.36**	**2.12**	**1.90**	**1.72**	**1.54**	**1.39**	**1.25**
2011	**2.30**	**9.33**	**15.21**	**18.23**	**18.10**	**17.54**	**16.46**	**15.93**	**15.26**	**15.16**	**15.55**	**14.42**	**13.23**	**12.11**	**10.76**	**8.75**	**7.70**	**6.85**	**6.12**	**5.48**	**4.91**	**4.41**	**3.95**	**3.54**	**3.18**	**2.85**	**2.56**	**2.30**	**2.07**	**1.86**
2012	**3.57**	**18.10**	**29.33**	**31.85**	**30.79**	**29.10**	**28.42**	**27.27**	**27.10**	**26.54**	**25.22**	**23.79**	**22.41**	**21.02**	**18.76**	**16.80**	**15.15**	**13.63**	**12.26**	**10.80**	**9.63**	**8.54**	**7.64**	**6.81**	**6.12**	**5.48**	**4.90**	**4.35**	**3.90**	**3.50**
2013	**4.15**	**17.62**	**24.41**	**24.81**	**23.63**	**23.54**	**22.76**	**22.37**	**22.11**	**20.86**	**19.45**	**18.44**	**17.03**	**14.93**	**13.35**	**12.02**	**10.79**	**9.69**	**8.70**	**7.80**	**7.00**	**6.26**	**5.55**	**4.98**	**4.44**	**3.78**	**3.32**	**2.96**	**2.66**	**2.39**
2014	**4.18**	**15.54**	**20.93**	**21.61**	**20.85**	**20.13**	**20.11**	**19.84**	**19.02**	**18.08**	**16.83**	**15.62**	**13.74**	**12.29**	**11.07**	**9.94**	**8.92**	**7.93**	**7.08**	**6.26**	**5.59**	**5.01**	**4.50**	**4.03**	**3.62**	**3.25**	**2.91**	**2.62**	**2.35**	**2.11**
2015	**3.99**	**14.90**	**19.55**	**20.98**	**20.04**	**19.90**	**19.79**	**19.03**	**17.71**	**16.66**	**15.84**	**14.40**	**13.14**	**11.90**	**10.72**	**9.62**	**8.61**	**7.62**	**6.84**	**6.13**	**5.50**	**4.92**	**4.36**	**3.90**	**3.48**	**3.09**	**2.79**	**2.51**	**2.25**	**2.02**
2016	**4.09**	**14.92**	**20.14**	**20.83**	**20.49**	**20.13**	**19.48**	**18.70**	**17.64**	**16.64**	**15.32**	**14.29**	**13.11**	**11.85**	**10.68**	**9.60**	**8.62**	**7.72**	**6.92**	**6.10**	**5.48**	**4.84**	**4.26**	**3.80**	**3.41**	**3.06**	**2.75**	**2.47**	**2.22**	**1.99**
2017	**4.04**	**14.61**	**19.99**	**21.26**	**20.31**	**19.23**	**18.60**	**17.88**	**17.03**	**15.32**	**14.49**	**13.67**	**12.49**	**11.27**	**10.08**	**9.01**	**7.89**	**7.02**	**6.29**	**5.64**	**5.06**	**4.54**	**4.08**	**3.64**	**3.29**	**2.95**	**2.65**	**2.38**	**2.14**	**1.92**

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
1981	0.13	1.80	5.39	8.36	11.15	13.52	15.80	17.72	18.95	19.83	20.49	20.96	21.34	21.63	21.85	21.99	22.10	22.20	22.26	22.30	22.33	22.35	22.37	22.38	22.39	22.40	22.40	22.40	22.41	**22.41**
1982	0.17	2.72	6.54	10.37	13.76	16.28	17.96	18.90	19.44	19.82	20.13	20.33	20.51	20.64	20.72	20.79	20.85	20.89	20.91	20.92	20.94	20.96	20.97	20.98	20.98	20.98	20.98	20.98	**20.98**	**20.98**
1983	0.03	0.67	2.45	4.73	7.38	9.95	11.84	13.03	13.90	14.58	15.04	15.39	15.62	15.76	15.88	15.99	16.05	16.09	16.13	16.14	16.16	16.18	16.18	16.19	16.19	16.20	16.20	**16.20**	**16.20**	**16.20**
1984	0.07	1.37	4.36	8.03	11.51	14.03	15.53	16.55	17.33	17.87	18.30	18.58	18.78	18.95	19.06	19.15	19.22	19.26	19.29	19.31	19.33	19.34	19.35	19.36	19.36	19.37	**19.38**	**19.38**	**19.38**	**19.38**
1985	0.05	1.29	4.61	8.57	11.45	13.30	14.61	15.60	16.31	16.82	17.16	17.39	17.58	17.73	17.82	17.90	17.95	17.99	18.01	18.03	18.04	18.05	18.06	18.06	18.07	**18.08**	**18.08**	**18.08**	**18.08**	**18.08**
1986	0.04	0.84	3.03	5.37	7.35	8.99	10.32	11.36	12.15	12.73	13.14	13.48	13.74	13.93	14.05	14.14	14.20	14.25	14.28	14.30	14.31	14.32	14.33	14.34	**14.35**	**14.35**	**14.36**	**14.36**	**14.36**	**14.36**
1987	0.04	0.61	1.87	3.25	4.56	5.78	6.79	7.65	8.31	8.83	9.28	9.65	9.92	10.12	10.23	10.31	10.38	10.43	10.46	10.48	10.49	10.50	10.52	**10.53**	**10.53**	**10.54**	**10.54**	**10.54**	**10.54**	**10.55**
1988	0.04	0.55	1.70	3.11	4.62	5.89	6.98	7.80	8.40	8.90	9.31	9.63	9.85	9.98	10.08	10.15	10.22	10.25	10.28	10.30	10.31	10.33	**10.36**	**10.37**	**10.37**	**10.38**	**10.38**	**10.38**	**10.38**	**10.38**
1989	0.03	0.51	1.85	3.55	5.15	6.53	7.56	8.34	8.96	9.43	9.77	10.01	10.16	10.26	10.35	10.41	10.45	10.48	10.50	10.52	10.54	**10.56**	**10.57**	**10.57**	**10.58**	**10.58**	**10.58**	**10.59**	**10.59**	**10.59**
1990	0.02	0.43	1.62	3.11	4.47	5.46	6.19	6.83	7.32	7.68	7.93	8.08	8.19	8.28	8.35	8.39	8.42	8.45	8.47	8.48	**8.50**	**8.51**	**8.52**	**8.53**	**8.53**	**8.53**	**8.54**	**8.54**	**8.54**	**8.54**
1991	0.02	0.47	1.69	3.05	4.16	4.98	5.69	6.24	6.64	6.93	7.10	7.23	7.32	7.39	7.45	7.48	7.50	7.53	7.55	**7.57**	**7.58**	**7.59**	**7.60**	**7.61**	**7.61**	**7.61**	**7.62**	**7.62**	**7.62**	**7.62**
1992	0.02	0.38	1.27	2.31	3.22	4.14	4.91	5.49	5.90	6.16	6.35	6.48	6.57	6.63	6.68	6.71	6.74	6.76	**6.79**	**6.80**	**6.81**	**6.82**	**6.83**	**6.83**	**6.83**	**6.84**	**6.84**	**6.84**	**6.84**	**6.84**
1993	0.01	0.27	0.93	1.78	2.77	3.71	4.46	5.02	5.36	5.62	5.81	5.95	6.03	6.09	6.12	6.16	6.19	**6.23**	**6.25**	**6.26**	**6.27**	**6.28**	**6.29**	**6.29**	**6.29**	**6.30**	**6.30**	**6.30**	**6.30**	**6.30**
1994	0.01	0.26	0.95	1.99	3.15	4.14	4.86	5.31	5.64	5.90	6.09	6.21	6.29	6.34	6.39	6.43	**6.48**	**6.51**	**6.54**	**6.56**	**6.57**	**6.58**	**6.58**	**6.59**	**6.59**	**6.59**	**6.59**	**6.59**	**6.60**	**6.60**
1995	0.02	0.38	1.52	3.16	4.62	5.74	6.49	7.02	7.48	7.79	7.98	8.11	8.20	8.27	8.35	**8.44**	**8.48**	**8.51**	**8.53**	**8.55**	**8.56**	**8.57**	**8.57**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**
1996	0.01	0.39	1.68	3.33	4.75	5.76	6.50	7.15	7.61	7.89	8.07	8.19	8.29	8.38	**8.49**	**8.55**	**8.60**	**8.63**	**8.65**	**8.66**	**8.67**	**8.68**	**8.69**	**8.69**	**8.70**	**8.70**	**8.70**	**8.70**	**8.70**	**8.70**
1997	0.02	0.51	1.83	3.32	4.49	5.45	6.31	6.89	7.26	7.49	7.65	7.78	7.90	**8.03**	**8.11**	**8.16**	**8.20**	**8.22**	**8.24**	**8.26**	**8.27**	**8.27**	**8.28**	**8.28**	**8.29**	**8.29**	**8.29**	**8.29**	**8.29**	**8.29**
1998	0.01	0.41	1.55	2.74	3.85	4.90	5.64	6.11	6.42	6.63	6.79	6.95	**7.12**	**7.23**	**7.31**	**7.36**	**7.39**	**7.42**	**7.43**	**7.45**	**7.46**	**7.46**	**7.47**	**7.47**	**7.48**	**7.48**	**7.48**	**7.48**	**7.48**	**7.48**
1999	0.01	0.45	1.47	2.74	4.19	5.22	5.89	6.28	6.55	6.77	6.97	**7.20**	**7.35**	**7.46**	**7.53**	**7.58**	**7.61**	**7.64**	**7.65**	**7.67**	**7.68**	**7.68**	**7.69**	**7.69**	**7.70**	**7.70**	**7.70**	**7.70**	**7.70**	**7.70**
2000	0.03	0.63	2.25	4.28	5.73	6.58	7.08	7.41	7.69	7.91	**8.16**	**8.34**	**8.47**	**8.56**	**8.62**	**8.66**	**8.69**	**8.71**	**8.72**	**8.73**	**8.74**	**8.74**	**8.75**	**8.75**	**8.75**	**8.75**	**8.75**	**8.75**	**8.75**	**8.75**
2001	0.02	0.70	2.53	4.30	5.47	6.17	6.64	7.01	7.31	**7.64**	**7.89**	**8.08**	**8.21**	**8.29**	**8.35**	**8.39**	**8.41**	**8.43**	**8.45**	**8.46**	**8.46**	**8.47**	**8.47**	**8.47**	**8.48**	**8.48**	**8.48**	**8.48**	**8.48**	**8.48**
2002	0.02	0.73	2.36	3.79	4.74	5.40	5.92	6.39	**6.93**	**7.38**	**7.73**	**7.96**	**8.11**	**8.22**	**8.29**	**8.34**	**8.38**	**8.40**	**8.42**	**8.43**	**8.44**	**8.45**	**8.46**	**8.46**	**8.46**	**8.46**	**8.47**	**8.47**	**8.47**	**8.47**
2003	0.03	0.82	2.32	3.62	4.62	5.51	6.36	**7.37**	**8.26**	**8.90**	**9.31**	**9.64**	**9.88**	**10.07**	**10.20**	**10.30**	**10.37**	**10.42**	**10.47**	**10.50**	**10.52**	**10.54**	**10.55**	**10.56**	**10.57**	**10.58**	**10.58**	**10.58**	**10.58**	**10.59**
2004	0.07	0.90	2.24	3.64	5.06	6.41	**7.97**	**9.51**	**10.60**	**11.32**	**11.87**	**12.30**	**12.61**	**12.84**	**13.00**	**13.13**	**13.22**	**13.29**	**13.34**	**13.38**	**13.41**	**13.43**	**13.45**	**13.46**	**13.47**	**13.48**	**13.48**	**13.49**	**13.49**	**13.49**
2005	0.05	0.71	2.35	4.39	6.62	**9.13**	**11.22**	**12.49**	**13.29**	**14.02**	**14.60**	**15.02**	**15.31**	**15.51**	**15.65**	**15.75**	**15.82**	**15.87**	**15.91**	**15.94**	**15.96**	**15.97**	**15.98**	**15.99**	**15.99**	**16.00**	**16.00**	**16.00**	**16.01**	**16.01**
2006	0.02	0.71	2.78	5.67	**9.23**	**12.10**	**13.77**	**14.76**	**15.66**	**16.38**	**16.92**	**17.29**	**17.55**	**17.72**	**17.83**	**17.90**	**17.96**	**17.99**	**18.02**	**18.03**	**18.05**	**18.05**	**18.06**	**18.06**	**18.07**	**18.07**	**18.07**	**18.07**	**18.07**	**18.08**
2007	0.02	0.91	3.69	**7.67**	**11.62**	**14.12**	**15.55**	**16.80**	**17.77**	**18.50**	**19.03**	**19.40**	**19.64**	**19.81**	**19.92**	**19.99**	**20.04**	**20.07**	**20.10**	**20.11**	**20.12**	**20.13**	**20.13**	**20.14**	**20.14**	**20.14**	**20.14**	**20.14**	**20.14**	**20.14**
2008	0.02	0.73	**3.25**	**6.93**	**9.53**	**11.07**	**12.41**	**13.45**	**14.23**	**14.81**	**15.22**	**15.51**	**15.70**	**15.84**	**15.93**	**15.99**	**16.03**	**16.06**	**16.08**	**16.09**	**16.10**	**16.10**	**16.11**	**16.11**	**16.11**	**16.12**	**16.12**	**16.12**	**16.12**	**16.12**
2009	0.02	**0.38**	**1.98**	**3.59**	**4.88**	**6.04**	**6.91**	**7.55**	**8.02**	**8.37**	**8.61**	**8.79**	**8.92**	**9.00**	**9.06**	**9.10**	**9.13**	**9.14**	**9.16**	**9.17**	**9.17**	**9.18**	**9.18**	**9.18**	**9.19**	**9.19**	**9.19**	**9.19**	**9.19**	**9.19**
2010	**0.01**	**0.41**	**1.46**	**2.71**	**3.98**	**4.95**	**5.65**	**6.16**	**6.51**	**6.77**	**6.96**	**7.09**	**7.19**	**7.25**	**7.29**	**7.32**	**7.34**	**7.36**	**7.37**	**7.37**	**7.38**	**7.39**	**7.39**	**7.39**	**7.39**	**7.39**	**7.40**	**7.40**	**7.40**	**7.40**
2011	**0.03**	**0.47**	**1.70**	**3.37**	**4.85**	**5.91**	**6.61**	**7.06**	**7.36**	**7.56**	**7.70**	**7.78**	**7.84**	**7.87**	**7.89**	**7.91**	**7.92**	**7.93**	**7.93**	**7.93**	**7.93**	**7.94**	**7.94**	**7.94**	**7.94**	**7.94**	**7.94**	**7.94**	**7.94**	**7.94**
2012	**0.03**	**0.57**	**2.16**	**3.94**	**5.32**	**6.18**	**6.66**	**6.94**	**7.11**	**7.20**	**7.26**	**7.30**	**7.32**	**7.33**	**7.33**	**7.34**	**7.34**	**7.34**	**7.34**	**7.34**	**7.34**	**7.34**	**7.34**	**7.34**	**7.34**	**7.34**	**7.34**	**7.34**	**7.34**	**7.34**
2013	**0.03**	**0.56**	**2.06**	**3.75**	**5.09**	**5.95**	**6.48**	**6.80**	**7.00**	**7.13**	**7.21**	**7.26**	**7.29**	**7.31**	**7.32**	**7.33**	**7.33**	**7.33**	**7.33**	**7.34**	**7.34**	**7.34**	**7.34**	**7.34**	**7.34**	**7.34**	**7.34**	**7.34**	**7.34**	**7.34**
2014	**0.03**	**0.61**	**2.28**	**4.19**	**5.73**	**6.77**	**7.41**	**7.84**	**8.11**	**8.29**	**8.40**	**8.47**	**8.51**	**8.53**	**8.55**	**8.56**	**8.57**	**8.57**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**
2015	**0.03**	**0.63**	**2.32**	**4.26**	**5.85**	**6.92**	**7.61**	**8.05**	**8.34**	**8.52**	**8.64**	**8.71**	**8.76**	**8.79**	**8.80**	**8.82**	**8.82**	**8.83**	**8.83**	**8.84**	**8.84**	**8.84**	**8.84**	**8.84**	**8.84**	**8.84**	**8.84**	**8.84**	**8.84**	**8.84**
2016	**0.03**	**0.64**	**2.35**	**4.31**	**5.89**	**6.99**	**7.70**	**8.14**	**8.43**	**8.61**	**8.72**	**8.79**	**8.83**	**8.86**	**8.88**	**8.89**	**8.90**	**8.90**	**8.90**	**8.91**	**8.91**	**8.91**	**8.91**	**8.91**	**8.91**	**8.91**	**8.91**	**8.91**	**8.91**	**8.91**
2017	**0.03**	**0.64**	**2.37**	**4.35**	**6.01**	**7.17**	**7.91**	**8.37**	**8.67**	**8.86**	**8.97**	**9.04**	**9.09**	**9.12**	**9.14**	**9.15**	**9.16**	**9.16**	**9.17**	**9.17**	**9.17**	**9.17**	**9.18**	**9.18**	**9.18**	**9.18**	**9.18**	**9.18**	**9.18**	**9.18**

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
1981	0.27	0.73	7.81	12.10	17.09	31.68	44.62	49.02	51.84	54.34	56.71	60.00	63.33	66.24	67.44	68.72	69.80	70.99	72.27	72.96	73.67	74.20	74.71	75.14	75.53	75.91	76.13	76.32	76.55	**76.82**
1982	0.46	19.23	27.24	36.24	53.66	64.06	67.18	69.06	70.34	71.43	72.61	73.76	74.80	75.29	75.78	76.23	76.69	77.23	77.48	77.70	77.94	78.08	78.23	78.34	78.46	78.56	78.61	78.65	**78.69**	**78.70**
1983	0.52	1.59	3.93	21.26	42.40	48.34	52.29	56.35	60.60	66.59	71.26	74.99	76.17	77.41	78.37	79.35	80.41	80.88	81.27	81.71	82.13	82.42	82.63	82.80	82.92	83.04	83.11	**83.17**	**83.19**	**83.21**
1984	0.32	1.87	20.42	40.46	46.56	50.62	54.38	57.87	62.53	66.59	70.08	71.24	72.42	73.35	74.32	75.24	75.72	76.11	76.54	76.96	77.41	77.63	77.90	78.02	78.14	78.37	**78.44**	**78.52**	**78.61**	**78.69**
1985	0.46	13.68	35.26	42.23	46.69	51.20	55.63	62.01	67.14	71.05	72.20	73.40	74.32	75.29	76.19	76.63	77.02	77.43	77.82	78.15	78.45	78.77	78.87	78.98	79.17	**79.30**	**79.41**	**79.52**	**79.64**	**79.74**
1986	1.11	6.98	10.21	13.53	17.81	22.73	33.74	48.78	59.20	61.57	64.72	67.06	70.28	73.16	74.45	75.77	77.36	78.81	79.78	80.39	81.16	81.43	81.64	81.89	**82.03**	**82.18**	**82.36**	**82.53**	**82.68**	**82.81**
1987	0.51	1.64	3.47	6.34	9.59	17.41	33.33	46.42	49.63	54.16	57.62	62.94	68.11	70.32	72.85	75.94	79.08	80.94	82.10	83.24	83.79	84.16	84.52	**84.75**	**84.96**	**85.19**	**85.42**	**85.63**	**85.81**	**85.96**
1988	0.42	1.79	4.73	8.89	20.91	40.39	54.15	57.27	61.50	64.58	68.81	72.83	74.68	76.56	78.78	80.89	82.32	83.19	84.14	84.54	84.88	85.12	**85.29**	**85.50**	**85.73**	**85.95**	**86.14**	**86.31**	**86.45**	**86.58**
1989	0.35	2.16	6.14	20.16	42.00	56.58	59.67	63.76	66.66	70.65	74.36	76.05	77.80	79.87	81.75	83.07	83.90	84.74	85.07	85.30	85.55	**85.70**	**85.89**	**86.10**	**86.31**	**86.49**	**86.65**	**86.78**	**86.89**	**86.99**
1990	0.39	2.21	11.34	36.54	54.06	57.51	62.23	65.52	70.21	74.60	76.52	78.58	81.08	83.39	84.88	85.80	86.81	87.18	87.45	87.68	**87.87**	**88.08**	**88.30**	**88.52**	**88.71**	**88.87**	**89.01**	**89.12**	**89.22**	**89.31**
1991	0.44	6.07	30.96	51.18	54.88	60.15	63.83	69.29	74.31	76.33	78.65	81.50	84.17	85.83	86.82	87.83	88.20	88.46	88.70	**88.86**	**89.08**	**89.31**	**89.53**	**89.73**	**89.89**	**90.03**	**90.15**	**90.25**	**90.34**	**90.42**
1992	0.73	10.66	27.51	32.20	39.51	45.09	54.42	63.44	66.81	71.03	76.26	81.55	84.41	86.01	87.09	87.74	88.16	88.49	**88.73**	**89.04**	**89.33**	**89.63**	**89.91**	**90.14**	**90.33**	**90.49**	**90.63**	**90.75**	**90.85**	**90.94**
1993	1.36	7.11	11.24	18.20	24.61	34.97	46.37	51.45	58.09	66.71	76.81	81.57	84.15	85.69	86.64	87.28	87.75	**88.13**	**88.53**	**88.82**	**89.16**	**89.51**	**89.81**	**90.06**	**90.28**	**90.46**	**90.61**	**90.77**	**90.90**	**91.02**
1994	0.63	2.82	8.54	14.32	24.02	34.92	40.68	48.25	58.03	71.06	77.34	80.87	82.94	84.20	85.06	85.69	**86.19**	**86.71**	**87.06**	**87.44**	**87.82**	**88.18**	**88.49**	**88.75**	**88.97**	**89.16**	**89.35**	**89.51**	**89.66**	**89.78**
1995	2.07	11.38	17.90	31.57	44.05	48.96	55.82	64.17	73.21	78.23	81.19	82.98	84.06	84.70	85.09	**85.46**	**85.98**	**86.40**	**86.85**	**87.27**	**87.62**	**87.92**	**88.16**	**88.37**	**88.55**	**88.71**	**88.85**	**88.97**	**89.07**	**89.16**
1996	0.75	3.73	14.34	27.55	33.47	42.52	54.25	67.68	74.58	78.59	80.93	82.33	83.16	83.70	**84.15**	**84.72**	**85.14**	**85.60**	**86.06**	**86.47**	**86.80**	**87.08**	**87.32**	**87.52**	**87.71**	**87.88**	**88.02**	**88.14**	**88.25**	**88.34**
1997	1.02	11.61	26.62	32.22	41.76	54.02	67.46	74.53	78.67	81.06	82.45	83.29	83.83	**84.27**	**84.96**	**85.50**	**86.10**	**86.65**	**87.12**	**87.50**	**87.82**	**88.09**	**88.32**	**88.52**	**88.70**	**88.85**	**88.97**	**89.08**	**89.18**	**89.26**
1998	1.61	8.42	13.88	24.40	39.36	59.88	70.04	75.80	78.99	80.85	81.97	82.77	**83.43**	**84.27**	**84.80**	**85.38**	**85.96**	**86.52**	**86.98**	**87.36**	**87.68**	**87.96**	**88.22**	**88.45**	**88.65**	**88.81**	**88.96**	**89.08**	**89.19**	**89.27**
1999	0.91	3.96	14.00	30.21	53.78	65.77	72.79	76.57	78.77	80.10	81.08	**81.88**	**82.89**	**83.51**	**84.16**	**84.83**	**85.46**	**85.98**	**86.42**	**86.79**	**87.11**	**87.40**	**87.67**	**87.89**	**88.08**	**88.25**	**88.39**	**88.51**	**88.61**	**88.69**
2000	1.02	24.37	47.51	65.43	73.91	78.78	81.36	82.82	83.63	84.17	**84.61**	**85.35**	**85.95**	**86.60**	**87.18**	**87.67**	**88.05**	**88.36**	**88.62**	**88.82**	**89.01**	**89.16**	**89.29**	**89.40**	**89.49**	**89.57**	**89.64**	**89.69**	**89.74**	**89.78**
2001	7.54	26.18	55.36	67.92	74.68	78.23	80.17	81.33	82.24	**82.94**	**83.91**	**84.52**	**85.21**	**85.90**	**86.54**	**87.07**	**87.50**	**87.85**	**88.15**	**88.41**	**88.64**	**88.83**	**88.99**	**89.13**	**89.24**	**89.33**	**89.41**	**89.48**	**89.54**	**89.59**
2002	4.18	36.56	54.70	65.00	70.28	73.35	75.27	76.91	**78.17**	**79.63**	**80.50**	**81.36**	**82.26**	**83.16**	**83.93**	**84.58**	**85.13**	**85.59**	**86.01**	**86.39**	**86.70**	**86.97**	**87.19**	**87.38**	**87.54**	**87.67**	**87.78**	**87.88**	**87.97**	**88.04**
2003	6.97	21.67	37.49	46.51	52.01	55.36	58.40	**60.96**	**63.33**	**64.96**	**66.35**	**67.64**	**68.85**	**69.96**	**70.93**	**71.79**	**72.53**	**73.26**	**73.95**	**74.55**	**75.07**	**75.51**	**75.90**	**76.23**	**76.51**	**76.75**	**76.97**	**77.16**	**77.33**	**77.48**
2004	3.96	19.49	30.37	37.34	41.52	45.63	**48.80**	**51.51**	**53.57**	**55.35**	**57.03**	**58.60**	**60.02**	**61.31**	**62.45**	**63.45**	**64.41**	**65.30**	**66.07**	**66.74**	**67.32**	**67.82**	**68.25**	**68.61**	**68.93**	**69.21**	**69.46**	**69.67**	**69.87**	**70.02**
2005	3.24	10.87	18.11	22.95	27.67	**31.97**	**36.58**	**39.99**	**42.81**	**45.39**	**47.84**	**50.08**	**52.13**	**53.99**	**55.64**	**57.20**	**58.65**	**59.89**	**60.96**	**61.88**	**62.68**	**63.34**	**63.91**	**64.41**	**64.85**	**65.23**	**65.57**	**65.87**	**66.12**	**66.34**
2006	1.24	7.61	14.85	23.64	**29.54**	**35.21**	**38.95**	**42.03**	**44.94**	**47.76**	**50.35**	**52.68**	**54.86**	**56.81**	**58.66**	**60.40**	**61.89**	**63.15**	**64.22**	**65.13**	**65.88**	**66.51**	**67.04**	**67.51**	**67.92**	**68.27**	**68.58**	**68.84**	**69.08**	**69.27**
2007	1.35	10.58	22.54	**29.20**	**35.56**	**39.43**	**42.61**	**45.67**	**48.60**	**51.28**	**53.63**	**55.84**	**57.82**	**59.65**	**61.41**	**62.93**	**64.22**	**65.31**	**66.23**	**66.98**	**67.61**	**68.14**	**68.60**	**68.99**	**69.34**	**69.63**	**69.89**	**70.11**	**70.29**	**70.45**
2008	2.03	19.87	**29.17**	**36.69**	**41.44**	**45.11**	**48.37**	**51.38**	**54.11**	**56.50**	**58.68**	**60.63**	**62.48**	**64.25**	**65.80**	**67.14**	**68.29**	**69.29**	**70.10**	**70.78**	**71.37**	**71.87**	**72.30**	**72.68**	**73.00**	**73.28**	**73.52**	**73.71**	**73.88**	**74.03**
2009	6.17	**12.95**	**21.33**	**29.05**	**34.74**	**39.64**	**43.98**	**47.79**	**51.17**	**54.18**	**56.88**	**59.39**	**61.69**	**63.71**	**65.48**	**67.03**	**68.36**	**69.46**	**70.39**	**71.18**	**71.88**	**72.47**	**73.00**	**73.45**	**73.85**	**74.20**	**74.49**	**74.75**	**74.99**	**75.19**
2010	**0.87**	**7.55**	**16.88**	**24.77**	**31.56**	**37.42**	**42.52**	**47.03**	**51.03**	**54.49**	**57.57**	**60.33**	**62.73**	**64.80**	**66.56**	**68.05**	**69.28**	**70.31**	**71.20**	**71.96**	**72.63**	**73.21**	**73.72**	**74.16**	**74.56**	**74.90**	**75.20**	**75.47**	**75.71**	**75.92**
2011	**2.30**	**11.41**	**24.82**	**38.22**	**48.79**	**56.92**	**63.03**	**67.87**	**71.70**	**74.87**	**77.60**	**79.72**	**81.38**	**82.68**	**83.70**	**84.43**	**85.02**	**85.51**	**85.91**	**86.25**	**86.53**	**86.78**	**86.99**	**87.17**	**87.32**	**87.46**	**87.57**	**87.68**	**87.77**	**87.85**
2012	**3.57**	**21.02**	**44.02**	**61.16**	**71.91**	**78.53**	**82.88**	**85.73**	**87.72**	**89.09**	**90.02**	**90.67**	**91.13**	**91.45**	**91.68**	**91.85**	**91.97**	**92.07**	**92.14**	**92.20**	**92.24**	**92.28**	**92.31**	**92.33**	**92.35**	**92.37**	**92.38**	**92.39**	**92.40**	**92.41**
2013	**4.15**	**21.03**	**40.17**	**54.51**	**64.37**	**71.56**	**76.68**	**80.45**	**83.27**	**85.30**	**86.77**	**87.88**	**88.71**	**89.30**	**89.76**	**90.11**	**90.38**	**90.61**	**90.79**	**90.93**	**91.05**	**91.15**	**91.24**	**91.31**	**91.37**	**91.42**	**91.46**	**91.49**	**91.53**	**91.55**
2014	**4.18**	**19.06**	**35.88**	**49.24**	**58.95**	**66.06**	**71.52**	**75.70**	**78.83**	**81.19**	**82.96**	**84.31**	**85.31**	**86.07**	**86.66**	**87.14**	**87.52**	**87.83**	**88.09**	**88.30**	**88.47**	**88.62**	**88.74**	**88.85**	**88.95**	**89.03**	**89.10**	**89.16**	**89.21**	**89.26**
2015	**3.99**	**18.29**	**34.14**	**47.47**	**57.14**	**64.51**	**70.16**	**74.39**	**77.50**	**79.86**	**81.70**	**83.09**	**84.17**	**85.01**	**85.67**	**86.21**	**86.63**	**86.98**	**87.27**	**87.51**	**87.71**	**87.88**	**88.02**	**88.14**	**88.25**	**88.34**	**88.42**	**88.49**	**88.55**	**88.60**
2016	**4.09**	**18.40**	**34.70**	**47.81**	**57.62**	**64.97**	**70.43**	**74.52**	**77.58**	**79.91**	**81.66**	**83.04**	**84.11**	**84.95**	**85.61**	**86.14**	**86.57**	**86.92**	**87.21**	**87.44**	**87.64**	**87.81**	**87.95**	**88.07**	**88.17**	**88.26**	**88.34**	**88.41**	**88.47**	**88.52**
2017	**4.04**	**18.05**	**34.31**	**47.77**	**57.49**	**64.51**	**69.78**	**73.77**	**76.81**	**79.04**	**80.79**	**82.19**	**83.28**	**84.14**	**84.82**	**85.37**	**85.80**	**86.15**	**86.45**	**86.70**	**86.90**	**87.08**	**87.23**	**87.37**	**87.48**	**87.58**	**87.66**	**87.74**	**87.81**	**87.86**

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
1991	0.04	0.58	1.60	1.87	2.26	1.76	1.47	1.05	1.29	1.08	0.87	0.51	0.33	0.28	0.52	0.40	0.25	0.82	0.00	**0.65**	**0.04**	**0.05**	**0.04**	**0.03**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**
1992	0.01	0.36	0.90	1.09	1.08	1.03	0.92	0.79	0.72	0.39	0.38	0.31	0.47	0.23	0.50	0.21	0.06	0.56	**0.07**	**0.02**	**0.03**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**
1993	0.01	0.25	0.69	0.91	1.21	1.13	0.99	0.77	0.45	0.35	0.32	0.34	0.23	0.15	0.16	0.19	0.27	**0.22**	**0.07**	**0.07**	**0.05**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**
1994	0.03	0.34	0.73	1.04	1.10	0.92	0.72	0.46	0.37	0.30	0.31	0.29	0.18	0.19	0.15	0.17	**0.41**	**0.11**	**0.10**	**0.07**	**0.04**	**0.03**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**
1995	0.16	0.73	1.45	1.51	1.36	1.21	0.87	0.56	0.52	0.52	0.31	0.46	0.20	0.18	0.15	**0.15**	**0.17**	**0.14**	**0.11**	**0.07**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**
1996	0.02	0.48	1.38	1.65	1.50	0.87	0.71	0.81	0.65	0.60	0.63	0.55	0.50	0.55	**0.62**	**0.10**	**0.11**	**0.09**	**0.06**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**
1997	0.08	0.79	1.74	1.99	1.31	0.88	1.03	0.91	1.26	0.94	0.37	0.52	0.68	**0.30**	**0.31**	**0.26**	**0.19**	**0.12**	**0.08**	**0.06**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
1998	0.02	0.25	0.83	0.84	0.76	0.83	1.24	1.00	0.79	0.74	0.74	0.78	**0.95**	**0.57**	**0.51**	**0.36**	**0.19**	**0.11**	**0.08**	**0.06**	**0.04**	**0.03**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
1999	0.02	0.28	0.53	0.67	0.87	1.02	1.02	0.82	0.61	0.69	0.76	**0.80**	**0.47**	**0.46**	**0.32**	**0.18**	**0.11**	**0.08**	**0.05**	**0.04**	**0.03**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**
2000	0.02	0.44	1.09	1.70	2.35	1.93	1.21	1.15	1.25	1.12	**1.16**	**0.87**	**0.94**	**0.83**	**0.57**	**0.37**	**0.25**	**0.16**	**0.11**	**0.07**	**0.05**	**0.03**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**
2001	0.00	0.25	1.49	2.89	2.98	2.92	2.50	2.38	2.57	**3.07**	**1.61**	**1.53**	**1.03**	**0.53**	**0.29**	**0.19**	**0.13**	**0.09**	**0.06**	**0.04**	**0.03**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**
2002	0.02	0.51	1.89	2.28	2.07	1.77	1.81	1.94	**2.42**	**1.67**	**1.75**	**1.15**	**0.62**	**0.37**	**0.24**	**0.15**	**0.10**	**0.07**	**0.05**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**	**0.00**
2003	0.01	0.50	1.19	1.23	1.18	1.32	1.45	**2.01**	**1.90**	**1.46**	**0.81**	**0.54**	**0.38**	**0.25**	**0.17**	**0.12**	**0.09**	**0.06**	**0.04**	**0.03**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**	**0.00**
2004	0.08	0.74	1.15	1.25	1.44	1.70	**2.30**	**2.17**	**1.60**	**0.95**	**0.68**	**0.49**	**0.33**	**0.23**	**0.16**	**0.12**	**0.08**	**0.05**	**0.04**	**0.03**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**	**0.00**
2005	0.06	0.60	1.53	1.89	2.39	**3.36**	**2.87**	**2.04**	**1.14**	**0.94**	**0.73**	**0.50**	**0.32**	**0.21**	**0.14**	**0.09**	**0.06**	**0.04**	**0.03**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**	**0.00**
2006	0.07	1.03	2.18	3.03	**4.24**	**4.51**	**3.43**	**1.89**	**1.42**	**1.08**	**0.78**	**0.50**	**0.31**	**0.20**	**0.12**	**0.07**	**0.05**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**
2007	0.06	1.13	4.03	**5.93**	**7.73**	**7.03**	**3.79**	**2.77**	**2.09**	**1.55**	**1.11**	**0.72**	**0.46**	**0.28**	**0.16**	**0.10**	**0.07**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**
2008	0.02	1.35	**5.47**	**7.90**	**6.94**	**4.40**	**3.39**	**2.62**	**1.98**	**1.45**	**1.01**	**0.67**	**0.43**	**0.25**	**0.15**	**0.09**	**0.05**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**
2009	0.02	**0.72**	**3.44**	**3.66**	**3.69**	**3.31**	**2.45**	**1.80**	**1.32**	**0.95**	**0.67**	**0.45**	**0.27**	**0.17**	**0.10**	**0.06**	**0.04**	**0.03**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**
2010	**0.02**	**1.22**	**2.68**	**3.09**	**3.19**	**2.71**	**1.97**	**1.43**	**1.03**	**0.74**	**0.51**	**0.31**	**0.19**	**0.12**	**0.07**	**0.05**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**
2011	**0.11**	**1.32**	**2.86**	**3.67**	**3.96**	**3.59**	**2.66**	**1.93**	**1.39**	**1.00**	**0.67**	**0.42**	**0.26**	**0.15**	**0.09**	**0.06**	**0.04**	**0.03**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**
2012	**0.10**	**1.14**	**3.09**	**4.45**	**5.44**	**5.30**	**4.24**	**3.33**	**2.58**	**1.90**	**1.38**	**0.93**	**0.60**	**0.36**	**0.24**	**0.15**	**0.09**	**0.06**	**0.04**	**0.03**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**
2013	**0.06**	**0.81**	**2.36**	**3.21**	**3.56**	**3.33**	**2.54**	**1.85**	**1.32**	**1.01**	**0.74**	**0.50**	**0.33**	**0.22**	**0.16**	**0.11**	**0.07**	**0.05**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**
2014	**0.05**	**0.69**	**2.08**	**2.81**	**3.07**	**2.78**	**2.06**	**1.49**	**1.10**	**0.79**	**0.55**	**0.36**	**0.24**	**0.17**	**0.11**	**0.07**	**0.05**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**
2015	**0.05**	**0.67**	**2.05**	**2.75**	**3.06**	**2.76**	**2.00**	**1.50**	**1.13**	**0.82**	**0.56**	**0.38**	**0.26**	**0.18**	**0.12**	**0.08**	**0.05**	**0.04**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
2016	**0.04**	**0.65**	**1.98**	**2.70**	**2.92**	**2.58**	**1.96**	**1.43**	**1.04**	**0.73**	**0.51**	**0.35**	**0.24**	**0.16**	**0.10**	**0.07**	**0.05**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**
2017	**0.04**	**0.62**	**1.92**	**2.62**	**2.83**	**2.57**	**1.93**	**1.39**	**0.99**	**0.72**	**0.50**	**0.33**	**0.22**	**0.15**	**0.10**	**0.07**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

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
1991	3.95	33.13	45.27	40.05	11.31	17.37	13.55	20.35	23.60	11.03	14.36	20.62	22.45	19.10	13.41	18.83	8.27	7.12	8.04	**7.56**	**8.30**	**10.59**	**12.29**	**12.33**	**11.10**	**9.98**	**8.97**	**8.05**	**7.23**	**6.86**
1992	4.71	30.52	32.27	8.61	14.23	11.29	20.00	24.34	11.86	15.34	24.85	33.79	21.68	16.63	13.14	7.84	7.96	5.60	**5.16**	**5.39**	**6.56**	**8.10**	**8.15**	**7.20**	**6.42**	**5.72**	**5.10**	**4.55**	**4.32**	**3.99**
1993	5.26	15.54	6.23	9.72	8.76	16.79	21.69	11.01	16.58	27.31	42.23	29.03	20.16	17.29	10.01	8.42	7.39	**6.01**	**6.50**	**6.44**	**9.00**	**9.69**	**8.88**	**7.93**	**7.07**	**6.10**	**5.61**	**5.66**	**5.19**	**4.63**
1994	2.96	4.56	7.44	7.49	12.13	16.42	9.85	14.26	22.51	39.75	28.32	20.44	15.67	10.63	8.66	8.06	**6.65**	**6.84**	**6.09**	**8.47**	**9.38**	**9.12**	**8.16**	**7.30**	**6.53**	**5.83**	**5.98**	**5.62**	**5.01**	**4.49**
1995	3.64	11.54	8.12	14.72	17.89	10.00	15.16	22.21	33.64	26.18	19.60	13.06	9.26	7.58	6.56	**5.80**	**7.85**	**8.66**	**11.21**	**11.67**	**11.34**	**9.47**	**9.32**	**8.10**	**7.18**	**6.95**	**6.36**	**5.65**	**5.04**	**4.54**
1996	2.97	6.23	17.02	21.86	10.40	17.35	27.96	43.42	33.13	25.63	18.51	13.14	9.47	7.37	**7.26**	**8.95**	**9.15**	**12.18**	**12.98**	**11.86**	**10.03**	**9.31**	**8.28**	**7.35**	**7.08**	**6.38**	**5.89**	**5.22**	**4.72**	**4.29**
1997	4.38	25.31	24.95	9.62	18.15	28.92	41.19	33.55	27.61	20.14	12.69	10.56	7.14	**5.09**	**7.71**	**8.19**	**10.64**	**11.37**	**10.44**	**9.30**	**8.19**	**7.36**	**6.55**	**6.24**	**5.91**	**5.06**	**4.73**	**4.26**	**3.81**	**3.13**
1998	5.55	17.89	8.29	17.43	30.83	51.18	39.64	31.01	21.31	15.18	10.26	8.84	**7.64**	**10.61**	**8.85**	**12.52**	**13.99**	**13.98**	**12.54**	**11.17**	**9.56**	**8.94**	**9.00**	**8.61**	**7.67**	**6.76**	**6.05**	**5.39**	**4.39**	**3.82**
1999	3.77	6.26	13.52	24.76	46.56	36.98	29.45	20.82	14.11	10.44	8.29	**7.48**	**11.43**	**8.44**	**10.35**	**11.92**	**12.63**	**11.42**	**10.09**	**9.19**	**8.11**	**7.90**	**7.99**	**7.09**	**6.29**	**5.50**	**4.96**	**4.07**	**3.50**	**3.11**
2000	4.11	24.81	30.50	42.04	36.72	29.72	21.40	15.70	9.03	7.83	**7.19**	**11.64**	**12.30**	**17.07**	**18.39**	**17.03**	**15.68**	**14.53**	**13.02**	**11.64**	**11.31**	**10.35**	**9.15**	**8.13**	**7.37**	**6.42**	**5.30**	**4.58**	**4.08**	**3.46**
2001	8.37	32.84	52.04	38.46	31.78	22.57	15.43	10.37	8.59	**7.15**	**11.48**	**8.98**	**12.32**	**14.63**	**16.12**	**14.91**	**13.33**	**12.10**	**10.83**	**10.50**	**10.17**	**9.33**	**8.30**	**7.38**	**6.56**	**5.29**	**4.64**	**4.14**	**3.68**	**3.28**
2002	12.81	48.47	35.27	28.97	20.46	14.44	9.78	9.40	**8.21**	**12.28**	**8.93**	**10.92**	**13.42**	**14.81**	**13.87**	**12.45**	**11.46**	**10.28**	**9.89**	**10.23**	**9.01**	**8.07**	**7.17**	**6.37**	**5.23**	**4.48**	**3.97**	**3.53**	**3.14**	**2.79**
2003	14.84	21.97	24.09	17.37	12.48	8.52	9.21	**8.33**	**10.46**	**8.13**	**9.25**	**10.21**	**9.75**	**9.08**	**8.22**	**7.41**	**6.71**	**7.40**	**7.41**	**6.60**	**5.86**	**5.27**	**4.69**	**3.86**	**3.34**	**2.97**	**2.65**	**2.37**	**2.11**	**1.88**
2004	8.45	20.27	15.53	11.43	7.37	6.91	**7.03**	**8.76**	**7.87**	**9.37**	**10.05**	**9.55**	**8.90**	**8.12**	**7.32**	**6.80**	**7.00**	**6.75**	**6.03**	**5.37**	**4.79**	**4.30**	**3.54**	**3.06**	**2.73**	**2.43**	**2.18**	**1.94**	**1.73**	**1.28**
2005	6.71	12.02	10.42	6.62	6.68	**6.86**	**10.11**	**8.75**	**10.73**	**12.03**	**11.72**	**11.21**	**10.58**	**9.84**	**9.20**	**9.58**	**9.29**	**8.29**	**7.38**	**6.55**	**5.86**	**4.84**	**4.18**	**3.72**	**3.30**	**2.89**	**2.64**	**2.35**	**1.98**	**1.71**
2006	4.06	9.97	7.24	8.85	**7.73**	**11.66**	**9.65**	**11.79**	**13.99**	**14.29**	**13.77**	**13.23**	**12.60**	**11.92**	**12.25**	**12.35**	**10.99**	**9.75**	**8.63**	**7.64**	**6.11**	**5.39**	**4.76**	**4.23**	**3.77**	**3.30**	**3.06**	**2.58**	**2.30**	**1.93**
2007	3.82	16.64	15.12	**8.79**	**11.35**	**8.64**	**11.04**	**13.76**	**14.78**	**15.05**	**14.70**	**14.50**	**13.74**	**14.35**	**14.96**	**13.60**	**12.19**	**10.94**	**9.77**	**8.09**	**7.03**	**6.34**	**5.68**	**5.06**	**4.50**	**3.94**	**3.43**	**3.05**	**2.49**	**2.21**
2008	4.16	23.01	**9.01**	**8.99**	**7.83**	**9.94**	**11.61**	**11.92**	**12.08**	**12.13**	**11.97**	**11.68**	**12.76**	**13.28**	**12.32**	**11.36**	**10.35**	**9.36**	**7.73**	**6.66**	**5.83**	**5.38**	**4.79**	**4.26**	**3.80**	**3.14**	**2.80**	**2.36**	**2.10**	**1.88**
2009	2.82	**5.91**	**8.65**	**9.25**	**10.67**	**11.76**	**11.92**	**12.05**	**12.12**	**12.19**	**12.21**	**12.54**	**12.61**	**11.84**	**10.97**	**10.22**	**9.37**	**7.84**	**6.87**	**6.16**	**5.51**	**4.93**	**4.40**	**3.93**	**3.48**	**3.10**	**2.77**	**2.47**	**2.20**	**1.97**
2010	**1.35**	**8.60**	**10.57**	**11.86**	**12.89**	**13.04**	**13.16**	**13.27**	**13.34**	**13.39**	**13.64**	**13.59**	**12.72**	**11.83**	**10.94**	**10.02**	**8.37**	**7.29**	**6.53**	**5.83**	**5.20**	**4.66**	**4.16**	**3.71**	**3.31**	**2.95**	**2.64**	**2.35**	**2.10**	**1.87**
2011	**4.20**	**13.63**	**19.67**	**22.92**	**23.56**	**23.17**	**22.66**	**22.39**	**22.48**	**23.74**	**24.56**	**22.39**	**20.33**	**18.39**	**16.28**	**12.82**	**11.02**	**9.73**	**8.62**	**7.63**	**6.79**	**6.03**	**5.35**	**4.75**	**4.22**	**3.79**	**3.37**	**2.99**	**2.66**	**2.37**
2012	**7.83**	**31.15**	**40.78**	**40.15**	**37.99**	**36.77**	**36.26**	**35.72**	**36.88**	**37.41**	**35.48**	**33.17**	**30.87**	**28.43**	**24.16**	**21.23**	**19.12**	**17.01**	**15.06**	**12.94**	**11.27**	**9.87**	**8.68**	**7.61**	**6.72**	**5.90**	**5.23**	**4.60**	**4.07**	**3.61**
2013	**11.01**	**34.53**	**36.56**	**33.51**	**32.14**	**31.60**	**31.50**	**31.95**	**34.04**	**32.08**	**29.73**	**27.21**	**24.50**	**20.33**	**17.59**	**15.59**	**13.85**	**12.26**	**10.85**	**9.61**	**8.53**	**7.64**	**6.75**	**5.99**	**5.27**	**4.24**	**3.64**	**3.23**	**2.87**	**2.56**
2014	**12.63**	**33.64**	**34.91**	**31.80**	**30.43**	**29.77**	**30.99**	**31.73**	**30.30**	**28.52**	**25.20**	**22.46**	**18.35**	**15.68**	**13.84**	**12.16**	**10.70**	**9.36**	**8.27**	**7.23**	**6.37**	**5.64**	**5.01**	**4.45**	**3.95**	**3.50**	**3.10**	**2.78**	**2.47**	**2.20**
2015	**13.33**	**33.56**	**33.73**	**32.14**	**30.44**	**31.01**	**32.04**	**31.03**	**29.33**	**27.67**	**25.82**	**21.98**	**19.28**	**17.18**	**15.29**	**13.60**	**12.01**	**10.48**	**9.29**	**8.25**	**7.33**	**6.48**	**5.67**	**5.02**	**4.42**	**3.83**	**3.64**	**3.24**	**2.89**	**2.58**
2016	**13.09**	**33.18**	**34.60**	**31.83**	**31.93**	**32.25**	**31.44**	**30.15**	**28.61**	**27.17**	**23.45**	**20.69**	**18.49**	**16.45**	**14.52**	**12.79**	**11.29**	**9.98**	**8.79**	**7.52**	**6.65**	**5.86**	**5.15**	**4.56**	**4.04**	**3.58**	**3.20**	**2.85**	**2.63**	**2.34**
2017	**12.54**	**33.32**	**34.51**	**33.03**	**32.50**	**31.49**	**30.80**	**29.80**	**28.47**	**25.17**	**22.88**	**20.86**	**18.65**	**16.54**	**14.58**	**12.78**	**11.34**	**10.04**	**8.90**	**7.89**	**7.01**	**6.22**	**5.53**	**4.91**	**4.38**	**3.91**	**3.51**	**3.12**	**2.78**	**2.48**

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
1991	0.04	0.60	1.61	2.25	2.69	2.99	3.19	3.31	3.43	3.51	3.56	3.59	3.60	3.61	3.62	3.63	3.63	3.65	3.65	**3.66**	**3.66**	**3.66**	**3.66**	**3.66**	**3.66**	**3.66**	**3.66**	**3.66**	**3.66**	**3.66**
1992	0.01	0.35	0.94	1.42	1.85	2.20	2.47	2.65	2.78	2.84	2.89	2.92	2.95	2.96	2.98	2.99	2.99	3.00	**3.01**	**3.01**	**3.01**	**3.01**	**3.01**	**3.01**	**3.01**	**3.01**	**3.01**	**3.01**	**3.01**	**3.01**
1993	0.01	0.25	0.80	1.48	2.28	2.95	3.44	3.73	3.88	3.98	4.04	4.08	4.10	4.11	4.12	4.13	4.14	**4.15**	**4.15**	**4.15**	**4.16**	**4.16**	**4.16**	**4.16**	**4.16**	**4.16**	**4.16**	**4.16**	**4.16**	**4.16**
1994	0.03	0.35	1.03	1.90	2.75	3.37	3.77	4.00	4.16	4.26	4.32	4.36	4.38	4.40	4.41	4.42	**4.45**	**4.46**	**4.46**	**4.47**	**4.47**	**4.47**	**4.47**	**4.47**	**4.47**	**4.47**	**4.47**	**4.47**	**4.47**	**4.47**
1995	0.16	0.86	2.09	3.24	4.10	4.73	5.13	5.34	5.50	5.60	5.64	5.69	5.71	5.73	5.74	**5.75**	**5.77**	**5.77**	**5.78**	**5.78**	**5.79**	**5.79**	**5.79**	**5.79**	**5.79**	**5.79**	**5.79**	**5.79**	**5.79**	**5.79**
1996	0.02	0.49	1.74	2.96	3.81	4.24	4.53	4.76	4.87	4.93	4.98	5.02	5.05	5.07	**5.10**	**5.11**	**5.11**	**5.11**	**5.11**	**5.12**	**5.12**	**5.12**	**5.12**	**5.12**	**5.12**	**5.12**	**5.12**	**5.12**	**5.12**	**5.12**
1997	0.08	0.84	2.06	3.09	3.69	4.02	4.28	4.42	4.54	4.61	4.63	4.65	4.68	**4.69**	**4.71**	**4.71**	**4.72**	**4.72**	**4.73**	**4.73**	**4.73**	**4.73**	**4.73**	**4.73**	**4.73**	**4.73**	**4.73**	**4.73**	**4.73**	**4.73**
1998	0.02	0.25	0.90	1.48	1.92	2.25	2.48	2.59	2.65	2.70	2.73	2.77	**2.81**	**2.83**	**2.84**	**2.85**	**2.86**	**2.86**	**2.86**	**2.86**	**2.86**	**2.86**	**2.86**	**2.87**	**2.87**	**2.87**	**2.87**	**2.87**	**2.87**	**2.87**
1999	0.02	0.29	0.77	1.28	1.78	2.09	2.28	2.39	2.45	2.51	2.57	**2.63**	**2.66**	**2.69**	**2.70**	**2.71**	**2.72**	**2.72**	**2.72**	**2.72**	**2.72**	**2.72**	**2.72**	**2.72**	**2.72**	**2.72**	**2.72**	**2.72**	**2.72**	**2.72**
2000	0.02	0.45	1.23	2.06	2.71	3.04	3.18	3.28	3.37	3.45	**3.52**	**3.56**	**3.61**	**3.64**	**3.66**	**3.67**	**3.68**	**3.68**	**3.68**	**3.69**	**3.69**	**3.69**	**3.69**	**3.69**	**3.69**	**3.69**	**3.69**	**3.69**	**3.69**	**3.69**
2001	0.00	0.23	1.14	1.97	2.46	2.78	2.99	3.14	3.29	**3.45**	**3.53**	**3.59**	**3.63**	**3.64**	**3.65**	**3.65**	**3.66**	**3.66**	**3.66**	**3.66**	**3.66**	**3.66**	**3.66**	**3.66**	**3.66**	**3.66**	**3.66**	**3.66**	**3.66**	**3.66**
2002	0.02	0.46	1.30	1.94	2.34	2.60	2.83	3.04	**3.28**	**3.42**	**3.55**	**3.63**	**3.67**	**3.69**	**3.70**	**3.70**	**3.71**	**3.71**	**3.71**	**3.71**	**3.71**	**3.71**	**3.71**	**3.71**	**3.71**	**3.71**	**3.71**	**3.71**	**3.71**	**3.71**
2003	0.01	0.44	1.22	1.83	2.30	2.76	3.21	**3.78**	**4.25**	**4.57**	**4.73**	**4.83**	**4.89**	**4.92**	**4.95**	**4.96**	**4.97**	**4.98**	**4.98**	**4.98**	**4.98**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**
2004	0.08	0.76	1.59	2.34	3.10	3.91	**4.92**	**5.79**	**6.35**	**6.66**	**6.85**	**6.98**	**7.06**	**7.10**	**7.14**	**7.16**	**7.17**	**7.18**	**7.18**	**7.19**	**7.19**	**7.19**	**7.19**	**7.19**	**7.19**	**7.20**	**7.20**	**7.20**	**7.20**	**7.20**
2005	0.06	0.63	1.87	3.22	4.79	**6.80**	**8.34**	**9.29**	**9.76**	**10.11**	**10.34**	**10.48**	**10.56**	**10.60**	**10.63**	**10.65**	**10.66**	**10.66**	**10.66**	**10.67**	**10.67**	**10.67**	**10.67**	**10.67**	**10.67**	**10.67**	**10.67**	**10.67**	**10.67**	**10.67**
2006	0.07	1.05	2.91	5.26	**8.14**	**10.85**	**12.58**	**13.40**	**13.94**	**14.28**	**14.49**	**14.61**	**14.67**	**14.71**	**14.72**	**14.73**	**14.74**	**14.74**	**14.75**	**14.75**	**14.75**	**14.75**	**14.75**	**14.75**	**14.75**	**14.75**	**14.75**	**14.75**	**14.75**	**14.75**
2007	0.06	1.14	4.33	**8.11**	**12.33**	**15.43**	**16.84**	**17.71**	**18.27**	**18.61**	**18.81**	**18.92**	**18.98**	**19.01**	**19.03**	**19.04**	**19.04**	**19.04**	**19.05**	**19.05**	**19.05**	**19.05**	**19.05**	**19.05**	**19.05**	**19.05**	**19.05**	**19.05**	**19.05**	**19.05**
2008	0.02	1.31	**5.28**	**10.18**	**13.75**	**15.68**	**16.95**	**17.79**	**18.33**	**18.67**	**18.88**	**19.00**	**19.06**	**19.10**	**19.11**	**19.12**	**19.13**	**19.13**	**19.13**	**19.13**	**19.13**	**19.13**	**19.14**	**19.14**	**19.14**	**19.14**	**19.14**	**19.14**	**19.14**	**19.14**
2009	0.02	**0.72**	**3.84**	**6.76**	**9.32**	**11.28**	**12.52**	**13.30**	**13.80**	**14.10**	**14.29**	**14.40**	**14.46**	**14.49**	**14.51**	**14.51**	**14.52**	**14.52**	**14.52**	**14.53**	**14.53**	**14.53**	**14.53**	**14.53**	**14.53**	**14.53**	**14.53**	**14.53**	**14.53**	**14.53**
2010	**0.02**	**1.22**	**3.61**	**5.99**	**8.09**	**9.58**	**10.49**	**11.06**	**11.40**	**11.62**	**11.74**	**11.81**	**11.84**	**11.86**	**11.87**	**11.88**	**11.88**	**11.88**	**11.89**	**11.89**	**11.89**	**11.89**	**11.89**	**11.89**	**11.89**	**11.89**	**11.89**	**11.89**	**11.89**	**11.89**
2011	**0.11**	**1.37**	**3.70**	**6.01**	**7.85**	**9.05**	**9.71**	**10.06**	**10.25**	**10.36**	**10.41**	**10.44**	**10.45**	**10.45**	**10.46**	**10.46**	**10.46**	**10.46**	**10.46**	**10.46**	**10.46**	**10.46**	**10.46**	**10.46**	**10.46**	**10.46**	**10.46**	**10.46**	**10.46**	**10.46**
2012	**0.10**	**1.15**	**3.07**	**4.63**	**5.68**	**6.26**	**6.53**	**6.66**	**6.72**	**6.75**	**6.76**	**6.76**	**6.76**	**6.77**	**6.77**	**6.77**	**6.77**	**6.77**	**6.77**	**6.77**	**6.77**	**6.77**	**6.77**	**6.77**	**6.77**	**6.77**	**6.77**	**6.77**	**6.77**	**6.77**
2013	**0.06**	**0.78**	**2.14**	**3.26**	**4.06**	**4.53**	**4.77**	**4.88**	**4.93**	**4.96**	**4.97**	**4.98**	**4.98**	**4.98**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**
2014	**0.05**	**0.65**	**1.84**	**2.86**	**3.59**	**4.02**	**4.24**	**4.35**	**4.40**	**4.43**	**4.44**	**4.45**	**4.45**	**4.45**	**4.45**	**4.45**	**4.45**	**4.45**	**4.45**	**4.45**	**4.45**	**4.45**	**4.45**	**4.45**	**4.45**	**4.45**	**4.45**	**4.45**	**4.45**	**4.45**
2015	**0.05**	**0.62**	**1.79**	**2.80**	**3.52**	**3.96**	**4.17**	**4.28**	**4.33**	**4.35**	**4.37**	**4.37**	**4.38**	**4.38**	**4.38**	**4.38**	**4.38**	**4.38**	**4.38**	**4.38**	**4.38**	**4.38**	**4.38**	**4.38**	**4.38**	**4.38**	**4.38**	**4.38**	**4.38**	**4.38**
2016	**0.04**	**0.60**	**1.74**	**2.73**	**3.43**	**3.83**	**4.03**	**4.12**	**4.17**	**4.19**	**4.21**	**4.21**	**4.21**	**4.22**	**4.22**	**4.22**	**4.22**	**4.22**	**4.22**	**4.22**	**4.22**	**4.22**	**4.22**	**4.22**	**4.22**	**4.22**	**4.22**	**4.22**	**4.22**	**4.22**
2017	**0.04**	**0.58**	**1.69**	**2.65**	**3.32**	**3.71**	**3.90**	**4.00**	**4.04**	**4.07**	**4.08**	**4.09**	**4.09**	**4.09**	**4.09**	**4.09**	**4.09**	**4.09**	**4.09**	**4.09**	**4.09**	**4.09**	**4.09**	**4.09**	**4.09**	**4.09**	**4.09**	**4.09**	**4.09**	**4.09**

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
1991	3.95	35.76	64.57	78.11	80.34	83.28	85.15	87.52	89.68	90.44	91.31	92.37	93.28	93.87	94.21	94.62	94.76	94.88	95.00	**95.10**	**95.20**	**95.32**	**95.45**	**95.56**	**95.65**	**95.72**	**95.77**	**95.82**	**95.86**	**95.89**
1992	4.71	33.78	55.04	58.83	64.48	68.28	74.19	79.87	81.94	84.29	87.49	90.74	92.12	92.94	93.48	93.75	94.01	94.18	**94.33**	**94.47**	**94.64**	**94.83**	**95.00**	**95.15**	**95.26**	**95.36**	**95.45**	**95.52**	**95.58**	**95.64**
1993	5.26	19.98	24.95	32.17	37.98	48.01	58.65	62.82	68.37	75.95	84.43	87.77	89.41	90.54	91.07	91.48	91.80	**92.05**	**92.29**	**92.52**	**92.82**	**93.11**	**93.36**	**93.55**	**93.71**	**93.84**	**93.96**	**94.06**	**94.16**	**94.23**
1994	2.96	7.38	14.25	20.59	30.00	41.04	46.51	53.60	63.15	76.14	81.69	84.55	86.29	87.28	88.00	88.62	**89.08**	**89.52**	**89.89**	**90.37**	**90.85**	**91.28**	**91.62**	**91.91**	**92.15**	**92.34**	**92.53**	**92.70**	**92.84**	**92.96**
1995	3.64	14.74	21.60	32.83	44.27	49.43	56.38	64.93	74.93	80.05	82.87	84.37	85.29	85.97	86.51	**86.96**	**87.54**	**88.12**	**88.80**	**89.43**	**89.98**	**90.38**	**90.73**	**91.02**	**91.25**	**91.45**	**91.63**	**91.77**	**91.90**	**92.00**
1996	2.97	9.02	24.42	40.56	46.43	55.07	66.44	79.05	84.41	87.16	88.62	89.46	89.99	90.35	**90.68**	**91.06**	**91.41**	**91.84**	**92.23**	**92.55**	**92.78**	**92.98**	**93.13**	**93.26**	**93.38**	**93.47**	**93.56**	**93.63**	**93.69**	**93.74**
1997	4.38	28.56	46.18	51.16	59.46	70.12	80.77	85.78	88.49	89.89	90.59	91.09	91.40	**91.60**	**91.88**	**92.16**	**92.50**	**92.81**	**93.07**	**93.27**	**93.44**	**93.57**	**93.68**	**93.78**	**93.87**	**93.94**	**94.01**	**94.06**	**94.11**	**94.14**
1998	5.55	22.44	28.85	41.10	58.80	78.90	86.37	89.83	91.44	92.34	92.85	93.24	**93.54**	**93.93**	**94.22**	**94.59**	**94.94**	**95.25**	**95.49**	**95.67**	**95.81**	**95.93**	**96.04**	**96.13**	**96.21**	**96.27**	**96.32**	**96.37**	**96.40**	**96.43**
1999	3.77	9.80	21.95	41.09	67.92	79.12	84.66	87.37	88.82	89.73	90.37	**90.90**	**91.64**	**92.12**	**92.66**	**93.21**	**93.73**	**94.13**	**94.45**	**94.71**	**94.92**	**95.11**	**95.28**	**95.42**	**95.54**	**95.63**	**95.71**	**95.78**	**95.83**	**95.88**
2000	4.11	27.89	49.75	70.36	80.48	85.48	87.94	89.33	90.00	90.52	**90.95**	**91.60**	**92.19**	**92.91**	**93.54**	**94.02**	**94.38**	**94.66**	**94.88**	**95.04**	**95.19**	**95.30**	**95.40**	**95.47**	**95.53**	**95.58**	**95.62**	**95.65**	**95.68**	**95.70**
2001	8.37	38.47	70.37	81.33	86.64	89.10	90.35	91.04	91.54	**91.91**	**92.44**	**92.80**	**93.25**	**93.71**	**94.13**	**94.46**	**94.72**	**94.91**	**95.07**	**95.20**	**95.32**	**95.41**	**95.49**	**95.55**	**95.60**	**95.64**	**95.68**	**95.70**	**95.73**	**95.75**
2002	12.81	55.06	70.75	78.85	82.78	84.93	86.15	87.18	**87.99**	**89.06**	**89.73**	**90.46**	**91.26**	**92.01**	**92.61**	**93.07**	**93.44**	**93.73**	**93.98**	**94.22**	**94.41**	**94.56**	**94.68**	**94.78**	**94.86**	**94.93**	**94.98**	**95.03**	**95.07**	**95.10**
2003	14.84	33.55	49.45	58.01	63.03	65.98	68.86	**71.19**	**73.81**	**75.59**	**77.43**	**79.25**	**80.80**	**82.10**	**83.17**	**84.05**	**84.78**	**85.54**	**86.24**	**86.82**	**87.30**	**87.71**	**88.05**	**88.32**	**88.54**	**88.74**	**88.90**	**89.05**	**89.17**	**89.28**
2004	8.45	26.99	38.22	45.09	48.97	52.28	**55.36**	**58.84**	**61.62**	**64.62**	**67.51**	**69.96**	**72.01**	**73.71**	**75.12**	**76.32**	**77.48**	**78.52**	**79.38**	**80.10**	**80.71**	**81.23**	**81.64**	**81.98**	**82.28**	**82.53**	**82.76**	**82.95**	**83.12**	**83.24**
2005	6.71	17.91	26.40	31.15	35.53	**39.63**	**45.04**	**49.12**	**53.58**	**57.99**	**61.73**	**64.87**	**67.47**	**69.64**	**71.45**	**73.17**	**74.67**	**75.89**	**76.88**	**77.70**	**78.38**	**78.91**	**79.34**	**79.71**	**80.03**	**80.30**	**80.54**	**80.75**	**80.92**	**81.06**
2006	4.06	13.61	19.79	26.63	**31.89**	**38.88**	**43.74**	**48.89**	**54.16**	**58.72**	**62.44**	**65.49**	**68.00**	**70.06**	**71.93**	**73.58**	**74.86**	**75.88**	**76.69**	**77.34**	**77.82**	**78.22**	**78.56**	**78.84**	**79.08**	**79.29**	**79.47**	**79.62**	**79.75**	**79.85**
2007	3.82	19.81	31.77	**37.38**	**43.57**	**47.38**	**51.48**	**55.84**	**59.75**	**63.06**	**65.75**	**67.99**	**69.79**	**71.40**	**72.83**	**73.94**	**74.80**	**75.47**	**76.01**	**76.41**	**76.73**	**77.00**	**77.22**	**77.41**	**77.57**	**77.70**	**77.81**	**77.91**	**77.98**	**78.05**
2008	4.16	26.21	**32.74**	**38.31**	**42.35**	**46.71**	**51.08**	**54.89**	**58.19**	**61.04**	**63.47**	**65.53**	**67.50**	**69.29**	**70.72**	**71.88**	**72.81**	**73.56**	**74.13**	**74.58**	**74.94**	**75.26**	**75.53**	**75.76**	**75.95**	**76.11**	**76.24**	**76.35**	**76.44**	**76.53**
2009	2.82	**8.56**	**16.40**	**23.78**	**31.19**	**38.19**	**44.21**	**49.42**	**53.94**	**57.87**	**61.29**	**64.36**	**67.04**	**69.23**	**71.01**	**72.49**	**73.71**	**74.63**	**75.38**	**76.00**	**76.52**	**76.96**	**77.34**	**77.66**	**77.93**	**78.16**	**78.37**	**78.54**	**78.69**	**78.83**
2010	**1.35**	**9.83**	**19.23**	**28.38**	**36.84**	**44.02**	**50.13**	**55.35**	**59.83**	**63.68**	**67.05**	**69.93**	**72.25**	**74.14**	**75.67**	**76.92**	**77.85**	**78.60**	**79.22**	**79.74**	**80.18**	**80.55**	**80.86**	**81.13**	**81.36**	**81.56**	**81.73**	**81.88**	**82.01**	**82.13**
2011	**4.20**	**17.24**	**33.24**	**47.70**	**58.61**	**66.38**	**71.95**	**76.05**	**79.18**	**81.69**	**83.64**	**84.97**	**85.90**	**86.58**	**87.06**	**87.38**	**87.62**	**87.80**	**87.95**	**88.07**	**88.17**	**88.26**	**88.32**	**88.38**	**88.43**	**88.47**	**88.51**	**88.54**	**88.57**	**88.59**
2012	**7.83**	**36.51**	**61.93**	**75.98**	**83.35**	**87.38**	**89.69**	**91.04**	**91.89**	**92.41**	**92.71**	**92.89**	**92.99**	**93.06**	**93.10**	**93.13**	**93.15**	**93.17**	**93.18**	**93.18**	**93.19**	**93.19**	**93.20**	**93.20**	**93.20**	**93.20**	**93.21**	**93.21**	**93.21**	**93.21**
2013	**11.01**	**41.71**	**62.74**	**74.51**	**81.65**	**86.17**	**89.10**	**91.06**	**92.44**	**93.28**	**93.80**	**94.14**	**94.35**	**94.49**	**94.58**	**94.65**	**94.70**	**94.74**	**94.77**	**94.79**	**94.81**	**94.83**	**94.84**	**94.85**	**94.86**	**94.86**	**94.87**	**94.87**	**94.88**	**94.88**
2014	**12.63**	**42.01**	**62.03**	**73.52**	**80.71**	**85.38**	**88.66**	**90.92**	**92.35**	**93.28**	**93.86**	**94.24**	**94.48**	**94.65**	**94.77**	**94.87**	**94.94**	**95.00**	**95.04**	**95.08**	**95.11**	**95.13**	**95.15**	**95.17**	**95.19**	**95.20**	**95.21**	**95.22**	**95.23**	**95.23**
2015	**13.33**	**42.40**	**61.62**	**73.38**	**80.63**	**85.54**	**88.91**	**91.05**	**92.42**	**93.32**	**93.92**	**94.30**	**94.55**	**94.74**	**94.87**	**94.97**	**95.05**	**95.11**	**95.16**	**95.20**	**95.23**	**95.25**	**95.27**	**95.29**	**95.30**	**95.32**	**95.33**	**95.34**	**95.34**	**95.35**
2016	**13.09**	**41.91**	**61.80**	**73.40**	**81.02**	**86.04**	**89.23**	**91.26**	**92.58**	**93.46**	**94.01**	**94.38**	**94.64**	**94.83**	**94.97**	**95.07**	**95.15**	**95.22**	**95.27**	**95.30**	**95.34**	**95.36**	**95.38**	**95.40**	**95.42**	**95.43**	**95.44**	**95.45**	**95.46**	**95.47**
2017	**12.54**	**41.67**	**61.60**	**73.73**	**81.41**	**86.22**	**89.32**	**91.34**	**92.67**	**93.49**	**94.05**	**94.44**	**94.72**	**94.91**	**95.06**	**95.17**	**95.25**	**95.32**	**95.37**	**95.41**	**95.45**	**95.47**	**95.50**	**95.52**	**95.54**	**95.55**	**95.56**	**95.57**	**95.58**	**95.59**

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
1996	0.00	0.11	0.37	0.47	0.49	0.47	0.41	0.48	0.27	0.36	0.37	0.18	0.08	0.05	**0.18**
1997	0.00	0.10	0.33	0.63	0.53	0.51	0.36	0.38	0.56	0.46	0.31	0.05	0.10	**0.29**	**1.19**
1998	0.00	0.13	0.31	0.35	0.54	0.41	0.43	0.50	0.26	0.25	0.13	0.29	**0.48**	**0.59**	**0.75**
1999	0.00	0.10	0.29	0.39	0.60	0.55	0.44	0.26	0.33	0.22	0.22	**0.18**	**0.60**	**0.77**	**0.82**
2000	0.00	0.15	0.61	1.32	1.55	0.63	0.92	0.49	0.43	0.74	**0.33**	**0.78**	**1.01**	**1.35**	**1.21**
2001	0.00	0.24	0.70	1.36	1.19	0.99	0.59	0.51	0.71	**0.81**	**0.94**	**1.15**	**1.28**	**0.99**	**0.70**
2002	0.01	0.26	0.63	0.72	0.79	0.45	0.38	0.33	**0.66**	**0.75**	**0.92**	**0.95**	**0.69**	**0.47**	**0.38**
2003	0.01	0.18	0.42	0.39	0.32	0.30	0.47	**0.47**	**0.70**	**0.69**	**0.75**	**0.52**	**0.33**	**0.24**	**0.20**
2004	0.03	0.16	0.37	0.55	0.57	0.53	**0.61**	**0.66**	**0.67**	**0.74**	**0.52**	**0.34**	**0.25**	**0.21**	**0.17**
2005	0.00	0.72	1.86	1.72	1.74	**1.75**	**2.59**	**2.61**	**2.82**	**2.03**	**1.33**	**1.04**	**0.88**	**0.76**	**0.73**
2006	0.04	1.53	2.26	2.85	**2.81**	**4.51**	**5.10**	**5.27**	**3.70**	**2.47**	**1.94**	**1.63**	**1.42**	**1.29**	**1.10**
2007	0.03	0.97	2.59	**2.86**	**4.88**	**5.85**	**5.90**	**4.05**	**2.80**	**2.20**	**1.85**	**1.61**	**1.43**	**1.24**	**1.18**
2008	0.01	0.42	**1.50**	**3.52**	**4.18**	**4.27**	**2.68**	**1.72**	**1.31**	**1.08**	**0.92**	**0.84**	**0.73**	**0.69**	**0.65**
2009	0.01	**0.21**	**0.84**	**1.16**	**1.35**	**0.90**	**0.59**	**0.46**	**0.39**	**0.34**	**0.31**	**0.28**	**0.26**	**0.24**	**0.21**
2010	**0.01**	**0.21**	**0.44**	**0.65**	**0.51**	**0.39**	**0.33**	**0.29**	**0.26**	**0.24**	**0.22**	**0.21**	**0.19**	**0.17**	**0.16**
2011	**0.05**	**0.34**	**0.85**	**1.06**	**1.00**	**0.94**	**0.86**	**0.79**	**0.73**	**0.67**	**0.62**	**0.58**	**0.54**	**0.49**	**0.44**
2012	**0.11**	**0.82**	**1.77**	**2.21**	**2.44**	**2.38**	**2.36**	**2.28**	**2.20**	**2.10**	**2.03**	**1.94**	**1.84**	**1.74**	**1.66**
2013	**0.11**	**0.68**	**1.22**	**1.48**	**1.56**	**1.55**	**1.47**	**1.35**	**1.29**	**1.23**	**1.14**	**1.04**	**0.95**	**0.87**	**0.76**
2014	**0.12**	**0.65**	**1.16**	**1.32**	**1.27**	**1.16**	**1.07**	**1.03**	**1.01**	**0.95**	**0.87**	**0.78**	**0.70**	**0.60**	**0.53**
2015	**0.13**	**0.67**	**1.16**	**1.29**	**1.25**	**1.11**	**1.05**	**1.00**	**0.93**	**0.85**	**0.78**	**0.71**	**0.62**	**0.55**	**0.49**
2016	**0.11**	**0.90**	**1.72**	**2.01**	**1.96**	**1.84**	**1.72**	**1.57**	**1.43**	**1.29**	**1.17**	**1.03**	**0.91**	**0.81**	**0.73**
2017	**0.20**	**1.02**	**1.71**	**1.88**	**1.87**	**1.77**	**1.65**	**1.52**	**1.39**	**1.28**	**1.14**	**1.02**	**0.92**	**0.83**	**0.75**

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
1996	1.12	4.33	9.32	13.38	9.89	13.15	18.15	23.02	18.27	16.03	14.92	12.82	12.84	15.18	**25.05**
1997	1.37	7.34	13.22	8.82	13.01	18.76	23.62	18.55	15.66	13.67	13.80	11.61	12.28	**13.85**	**20.51**
1998	1.53	6.82	7.28	11.63	17.34	26.89	20.14	17.03	14.58	13.37	11.40	10.73	**12.63**	**19.00**	**15.59**
1999	1.27	3.93	9.19	15.36	26.25	20.25	16.58	13.71	11.38	9.94	10.21	**10.84**	**17.89**	**14.55**	**20.18**
2000	1.21	14.11	24.10	32.03	22.60	18.15	14.57	11.17	8.71	8.44	**10.52**	**18.95**	**16.61**	**21.90**	**26.63**
2001	3.58	14.58	33.71	25.81	20.69	14.41	11.96	10.94	7.54	**10.28**	**15.88**	**13.11**	**18.46**	**23.71**	**24.16**
2002	3.11	25.51	23.94	19.79	14.80	12.19	10.66	7.90	**10.01**	**14.61**	**11.87**	**15.36**	**19.40**	**20.31**	**21.19**
2003	4.49	13.39	16.73	14.54	11.89	9.69	8.79	**9.42**	**12.01**	**10.60**	**11.24**	**12.86**	**13.52**	**14.18**	**14.84**
2004	3.40	12.11	12.89	11.17	8.72	7.84	**8.25**	**10.71**	**10.06**	**10.44**	**11.82**	**12.44**	**13.07**	**13.71**	**13.14**
2005	3.51	9.91	9.68	8.91	7.24	**7.65**	**9.42**	**8.31**	**9.15**	**10.86**	**11.59**	**12.25**	**12.87**	**13.50**	**14.86**
2006	3.72	9.43	10.54	10.25	**9.11**	**8.55**	**7.21**	**9.32**	**12.19**	**13.24**	**13.95**	**14.75**	**15.49**	**16.84**	**20.41**
2007	3.56	10.34	13.58	**10.22**	**8.37**	**6.60**	**9.05**	**12.54**	**13.78**	**14.72**	**15.51**	**16.39**	**17.43**	**20.79**	**22.05**
2008	1.59	14.34	**11.73**	**10.18**	**6.80**	**7.83**	**10.44**	**11.47**	**12.24**	**12.88**	**13.48**	**14.95**	**17.53**	**18.89**	**19.64**
2009	3.96	**6.70**	**9.25**	**9.64**	**7.86**	**8.85**	**9.56**	**10.15**	**10.69**	**11.22**	**12.06**	**13.57**	**14.80**	**15.47**	**16.16**
2010	**1.17**	**7.10**	**9.79**	**9.86**	**8.67**	**8.62**	**9.12**	**9.60**	**10.11**	**10.68**	**11.84**	**13.03**	**13.67**	**14.34**	**15.04**
2011	**3.35**	**8.51**	**12.57**	**15.63**	**12.44**	**12.23**	**12.68**	**13.35**	**14.17**	**16.04**	**17.69**	**18.32**	**18.92**	**19.33**	**19.81**
2012	**4.41**	**12.32**	**19.03**	**19.42**	**15.43**	**14.86**	**15.68**	**16.89**	**19.71**	**21.36**	**22.17**	**23.07**	**23.97**	**24.89**	**24.11**
2013	**4.35**	**13.07**	**17.48**	**17.51**	**14.06**	**14.46**	**15.42**	**17.34**	**18.84**	**19.65**	**20.49**	**21.36**	**22.24**	**21.54**	**22.01**
2014	**4.65**	**11.94**	**15.65**	**15.94**	**13.06**	**13.07**	**14.86**	**17.10**	**17.90**	**18.65**	**19.14**	**19.81**	**18.96**	**19.43**	**20.29**
2015	**5.23**	**11.91**	**15.32**	**15.47**	**12.30**	**13.59**	**14.89**	**15.50**	**16.23**	**16.98**	**17.73**	**17.27**	**17.70**	**18.51**	**19.34**
2016	**3.99**	**11.72**	**15.27**	**15.67**	**13.27**	**13.65**	**14.31**	**15.02**	**15.76**	**16.54**	**16.07**	**16.54**	**17.34**	**18.16**	**19.00**
2017	**4.09**	**10.89**	**14.12**	**15.24**	**12.79**	**12.54**	**13.12**	**13.74**	**14.39**	**13.95**	**14.18**	**14.78**	**15.42**	**16.05**	**16.75**

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
1996	0.00	0.10	0.46	0.85	1.21	1.52	1.75	1.98	2.07	2.18	2.27	2.31	2.32	2.33	**2.35**
1997	0.00	0.09	0.39	0.89	1.27	1.58	1.76	1.91	2.08	2.20	2.27	2.27	2.29	**2.33**	**2.48**
1998	0.00	0.13	0.42	0.71	1.11	1.37	1.56	1.73	1.81	1.87	1.90	1.95	**2.03**	**2.12**	**2.21**
1999	0.00	0.10	0.37	0.71	1.14	1.43	1.61	1.70	1.80	1.86	1.91	**1.95**	**2.06**	**2.18**	**2.29**
2000	0.00	0.14	0.66	1.50	2.16	2.36	2.60	2.71	2.79	2.93	**2.98**	**3.09**	**3.21**	**3.34**	**3.43**
2001	0.00	0.23	0.81	1.54	2.01	2.31	2.46	2.58	2.72	**2.87**	**3.03**	**3.18**	**3.33**	**3.42**	**3.47**
2002	0.01	0.26	0.71	1.10	1.44	1.60	1.73	1.82	**1.99**	**2.16**	**2.34**	**2.51**	**2.61**	**2.66**	**2.69**
2003	0.01	0.18	0.52	0.79	0.98	1.13	1.35	**1.54**	**1.81**	**2.03**	**2.25**	**2.38**	**2.46**	**2.50**	**2.53**
2004	0.03	0.19	0.50	0.90	1.27	1.59	**1.91**	**2.24**	**2.53**	**2.82**	**3.00**	**3.10**	**3.16**	**3.21**	**3.25**
2005	0.00	0.69	2.30	3.60	4.79	**5.88**	**7.34**	**8.63**	**9.87**	**10.66**	**11.11**	**11.42**	**11.64**	**11.81**	**11.95**
2006	0.04	1.52	3.46	5.59	**7.42**	**9.99**	**12.53**	**14.83**	**16.21**	**16.98**	**17.49**	**17.85**	**18.12**	**18.31**	**18.45**
2007	0.03	0.96	3.18	**5.23**	**8.27**	**11.43**	**14.22**	**15.85**	**16.79**	**17.41**	**17.84**	**18.15**	**18.38**	**18.53**	**18.65**
2008	0.01	0.42	**1.68**	**4.24**	**6.86**	**9.25**	**10.57**	**11.30**	**11.78**	**12.13**	**12.38**	**12.58**	**12.73**	**12.84**	**12.92**
2009	0.01	**0.22**	**0.97**	**1.90**	**2.86**	**3.45**	**3.80**	**4.04**	**4.23**	**4.37**	**4.48**	**4.57**	**4.65**	**4.70**	**4.75**
2010	**0.01**	**0.21**	**0.62**	**1.15**	**1.53**	**1.79**	**1.99**	**2.15**	**2.28**	**2.39**	**2.48**	**2.55**	**2.61**	**2.65**	**2.69**
2011	**0.05**	**0.38**	**1.13**	**1.94**	**2.58**	**3.09**	**3.51**	**3.83**	**4.09**	**4.29**	**4.45**	**4.57**	**4.66**	**4.72**	**4.77**
2012	**0.11**	**0.89**	**2.36**	**3.81**	**5.07**	**6.07**	**6.90**	**7.55**	**8.06**	**8.44**	**8.72**	**8.93**	**9.07**	**9.17**	**9.24**
2013	**0.11**	**0.76**	**1.77**	**2.76**	**3.61**	**4.32**	**4.88**	**5.31**	**5.65**	**5.90**	**6.09**	**6.23**	**6.32**	**6.39**	**6.43**
2014	**0.12**	**0.74**	**1.70**	**2.62**	**3.34**	**3.91**	**4.36**	**4.72**	**5.01**	**5.24**	**5.40**	**5.52**	**5.60**	**5.66**	**5.70**
2015	**0.13**	**0.77**	**1.72**	**2.62**	**3.33**	**3.89**	**4.33**	**4.69**	**4.96**	**5.17**	**5.33**	**5.45**	**5.53**	**5.59**	**5.64**
2016	**0.11**	**0.97**	**2.42**	**3.81**	**4.93**	**5.82**	**6.53**	**7.07**	**7.48**	**7.79**	**8.02**	**8.19**	**8.31**	**8.40**	**8.46**
2017	**0.20**	**1.18**	**2.62**	**3.95**	**5.05**	**5.94**	**6.65**	**7.21**	**7.64**	**7.97**	**8.22**	**8.42**	**8.56**	**8.67**	**8.75**

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
1996	1.12	5.40	14.21	25.63	32.90	41.57	51.89	62.57	69.05	73.67	77.28	79.90	82.18	84.53	**87.82**
1997	1.37	8.61	20.68	27.64	36.94	48.53	60.31	67.35	72.16	75.69	78.74	80.94	83.00	**85.04**	**87.63**
1998	1.53	8.24	14.91	24.76	37.68	54.14	63.10	69.12	73.37	76.69	79.13	81.17	**83.30**	**86.09**	**87.93**
1999	1.27	5.15	13.85	27.03	46.00	56.70	63.65	68.41	71.81	74.43	76.85	**79.16**	**82.54**	**84.78**	**87.41**
2000	1.21	15.15	35.56	55.99	65.60	71.45	75.27	77.74	79.44	80.94	**82.64**	**85.36**	**87.28**	**89.36**	**91.31**
2001	3.58	17.64	45.32	59.23	67.34	71.76	74.86	77.34	78.86	**80.75**	**83.35**	**85.14**	**87.29**	**89.52**	**91.22**
2002	3.11	27.82	45.04	55.77	62.16	66.60	69.98	72.22	**74.82**	**78.21**	**80.54**	**83.17**	**85.95**	**88.27**	**90.19**
2003	4.49	17.27	31.09	41.03	47.95	52.90	56.94	**60.87**	**65.38**	**68.86**	**72.13**	**75.43**	**78.43**	**81.14**	**83.56**
2004	3.40	15.09	26.01	34.22	39.87	44.49	**48.93**	**54.20**	**58.58**	**62.64**	**66.72**	**70.49**	**73.94**	**77.08**	**79.67**
2005	3.51	13.07	21.42	28.21	33.15	**37.90**	**43.19**	**47.30**	**51.33**	**55.55**	**59.46**	**63.07**	**66.35**	**69.32**	**72.13**
2006	3.72	12.80	21.83	29.49	**35.41**	**40.30**	**43.88**	**47.94**	**52.48**	**56.63**	**60.31**	**63.59**	**66.46**	**69.06**	**71.64**
2007	3.56	13.52	25.13	**32.46**	**37.68**	**41.24**	**45.53**	**50.57**	**55.20**	**59.32**	**62.93**	**66.08**	**68.83**	**71.49**	**73.69**
2008	1.59	15.70	**25.54**	**32.95**	**37.22**	**41.60**	**46.73**	**51.63**	**56.16**	**60.29**	**64.01**	**67.54**	**71.02**	**74.09**	**76.66**
2009	3.96	**10.40**	**18.67**	**26.42**	**32.05**	**37.81**	**43.43**	**48.78**	**53.82**	**58.53**	**63.01**	**67.42**	**71.57**	**75.25**	**78.49**
2010	**1.17**	**8.18**	**17.15**	**25.26**	**31.64**	**37.40**	**42.95**	**48.23**	**53.25**	**58.00**	**62.69**	**67.23**	**71.36**	**75.09**	**78.44**
2011	**3.35**	**11.57**	**22.64**	**34.56**	**42.46**	**49.18**	**55.23**	**60.74**	**65.76**	**70.60**	**75.04**	**78.80**	**81.95**	**84.54**	**86.66**
2012	**4.41**	**16.17**	**31.95**	**44.70**	**52.65**	**58.93**	**64.42**	**69.26**	**73.83**	**77.70**	**80.77**	**83.20**	**85.09**	**86.54**	**87.57**
2013	**4.35**	**16.84**	**31.24**	**42.97**	**50.60**	**57.22**	**63.15**	**68.69**	**73.59**	**77.67**	**81.03**	**83.78**	**86.01**	**87.66**	**88.97**
2014	**4.65**	**16.02**	**29.05**	**40.09**	**47.58**	**53.99**	**60.25**	**66.30**	**71.49**	**75.87**	**79.49**	**82.48**	**84.75**	**86.63**	**88.19**
2015	**5.23**	**16.51**	**29.18**	**39.87**	**46.94**	**53.70**	**60.02**	**65.54**	**70.37**	**74.56**	**78.15**	**81.01**	**83.40**	**85.45**	**87.18**
2016	**3.99**	**15.22**	**28.02**	**38.92**	**46.52**	**53.15**	**59.02**	**64.19**	**68.72**	**72.66**	**75.80**	**78.48**	**80.79**	**82.77**	**84.45**
2017	**4.09**	**14.51**	**26.42**	**37.23**	**44.75**	**51.05**	**56.69**	**61.73**	**66.20**	**69.85**	**72.99**	**75.77**	**78.21**	**80.33**	**82.17**

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
1991	0.02	0.10	0.30	0.40	0.47	0.06	0.27	0.08	0.18	0.11	0.00	0.00	0.00	0.27	1.02
1992	0.00	0.07	0.13	0.23	0.20	0.14	0.26	0.18	0.07	0.15	0.03	0.04	0.00	0.00	0.00
1993	0.00	0.05	0.12	0.13	0.17	0.14	0.11	0.15	0.10	0.07	0.03	0.05	0.02	0.01	0.00
1994	0.01	0.08	0.19	0.23	0.24	0.21	0.17	0.09	0.10	0.07	0.05	0.05	0.05	0.04	0.02
1995	0.04	0.22	0.37	0.52	0.42	0.35	0.27	0.21	0.10	0.05	0.06	0.11	0.00	0.00	0.07
1996	0.00	0.09	0.20	0.29	0.43	0.33	0.21	0.14	0.24	0.12	0.10	0.06	0.00	0.04	**0.01**
1997	0.00	0.10	0.24	0.33	0.36	0.24	0.18	0.21	0.11	0.14	0.06	0.00	0.00	**0.02**	**0.11**
1998	0.01	0.02	0.16	0.15	0.21	0.15	0.13	0.15	0.02	0.09	0.03	0.13	**0.17**	**0.12**	**0.10**
1999	0.00	0.05	0.09	0.11	0.15	0.14	0.16	0.11	0.06	0.03	0.08	**0.11**	**0.11**	**0.09**	**0.05**
2000	0.00	0.08	0.14	0.24	0.36	0.14	0.22	0.20	0.23	0.34	**0.42**	**0.16**	**0.17**	**0.10**	**0.07**
2001	0.00	0.05	0.12	0.24	0.57	0.32	0.19	0.21	0.36	**0.45**	**0.27**	**0.22**	**0.11**	**0.07**	**0.05**
2002	0.00	0.04	0.20	0.18	0.16	0.15	0.13	0.14	**0.16**	**0.22**	**0.18**	**0.09**	**0.06**	**0.04**	**0.03**
2003	0.00	0.05	0.11	0.15	0.12	0.17	0.17	**0.26**	**0.23**	**0.19**	**0.09**	**0.05**	**0.03**	**0.02**	**0.02**
2004	0.01	0.06	0.17	0.14	0.16	0.24	**0.38**	**0.31**	**0.24**	**0.12**	**0.07**	**0.04**	**0.03**	**0.02**	**0.01**
2005	0.01	0.10	0.13	0.20	0.38	**0.63**	**0.64**	**0.51**	**0.26**	**0.14**	**0.09**	**0.06**	**0.04**	**0.03**	**0.02**
2006	0.00	0.05	0.11	0.39	**0.65**	**1.33**	**1.05**	**0.56**	**0.32**	**0.20**	**0.13**	**0.09**	**0.06**	**0.04**	**0.03**
2007	0.00	0.12	0.26	**0.71**	**1.60**	**1.34**	**0.69**	**0.41**	**0.27**	**0.18**	**0.13**	**0.09**	**0.06**	**0.05**	**0.04**
2008	0.00	0.04	**0.89**	**2.76**	**2.11**	**1.02**	**0.54**	**0.35**	**0.24**	**0.17**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**
2009	0.00	**0.09**	**1.11**	**1.29**	**0.78**	**0.46**	**0.30**	**0.22**	**0.16**	**0.12**	**0.09**	**0.07**	**0.05**	**0.03**	**0.02**
2010	**0.02**	**0.48**	**0.97**	**0.75**	**0.52**	**0.34**	**0.24**	**0.18**	**0.13**	**0.10**	**0.08**	**0.05**	**0.04**	**0.03**	**0.02**
2011	**0.10**	**0.56**	**0.88**	**0.89**	**0.75**	**0.53**	**0.39**	**0.30**	**0.24**	**0.18**	**0.13**	**0.09**	**0.07**	**0.05**	**0.05**
2012	**0.09**	**0.47**	**0.99**	**1.15**	**1.01**	**0.78**	**0.60**	**0.48**	**0.38**	**0.29**	**0.21**	**0.16**	**0.13**	**0.11**	**0.10**
2013	**0.05**	**0.35**	**0.78**	**0.90**	**0.78**	**0.59**	**0.46**	**0.38**	**0.29**	**0.21**	**0.15**	**0.11**	**0.09**	**0.07**	**0.07**
2014	**0.05**	**0.32**	**0.68**	**0.77**	**0.67**	**0.53**	**0.41**	**0.31**	**0.23**	**0.17**	**0.13**	**0.09**	**0.07**	**0.06**	**0.06**
2015	**0.05**	**0.31**	**0.65**	**0.74**	**0.63**	**0.50**	**0.38**	**0.28**	**0.21**	**0.16**	**0.11**	**0.08**	**0.07**	**0.06**	**0.05**
2016	**0.05**	**0.31**	**0.63**	**0.73**	**0.63**	**0.46**	**0.34**	**0.26**	**0.20**	**0.15**	**0.11**	**0.09**	**0.07**	**0.06**	**0.06**
2017	**0.04**	**0.26**	**0.56**	**0.63**	**0.52**	**0.40**	**0.31**	**0.24**	**0.19**	**0.14**	**0.12**	**0.09**	**0.07**	**0.05**	**0.05**

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
1991	1.13	9.81	26.11	29.26	9.58	13.44	10.15	18.39	19.52	14.91	16.33	18.87	25.45	21.33	27.55
1992	1.31	11.84	18.87	7.64	11.93	10.53	15.50	18.14	11.48	15.07	20.95	24.07	22.56	22.68	30.91
1993	2.05	8.75	6.31	9.59	9.57	13.87	16.82	11.59	14.34	20.02	26.83	21.70	20.32	23.53	31.32
1994	2.08	4.46	7.57	8.17	11.61	14.21	10.19	12.88	17.01	23.91	20.70	18.79	20.64	21.06	45.35
1995	2.85	8.75	8.32	12.11	14.68	9.81	11.86	16.57	19.96	16.86	15.47	15.52	16.89	24.43	59.95
1996	1.34	4.94	9.90	14.08	9.53	12.69	17.56	26.59	22.30	17.45	18.46	15.58	16.86	20.85	**32.98**
1997	1.91	9.52	14.29	8.30	10.99	18.07	25.12	20.70	17.65	15.47	14.54	12.96	15.85	**22.53**	**44.49**
1998	1.66	7.71	6.63	10.12	15.83	28.23	21.73	16.68	15.77	13.39	14.25	12.45	**16.95**	**33.48**	**46.17**
1999	1.77	4.55	8.48	13.71	25.14	20.27	16.24	14.24	11.86	11.42	11.55	**13.29**	**26.05**	**36.52**	**58.77**
2000	2.45	9.79	15.29	24.51	22.70	16.50	15.27	13.50	9.82	9.72	**11.42**	**18.36**	**27.21**	**49.89**	**67.20**
2001	1.70	12.60	33.82	25.65	20.59	13.87	11.60	10.01	9.25	**9.18**	**12.07**	**17.99**	**31.99**	**47.80**	**59.55**
2002	2.83	22.20	19.33	17.03	12.86	10.24	9.00	8.35	**8.71**	**9.82**	**13.44**	**22.89**	**34.99**	**46.29**	**58.47**
2003	4.45	10.49	13.04	11.44	9.49	7.94	7.46	**7.71**	**9.09**	**9.08**	**13.82**	**21.64**	**30.19**	**40.83**	**53.05**
2004	3.36	9.62	10.53	8.52	6.85	5.88	**6.83**	**8.64**	**8.14**	**10.08**	**15.75**	**22.40**	**31.16**	**41.99**	**50.16**
2005	2.72	7.85	8.09	6.28	4.98	**6.42**	**9.03**	**8.32**	**8.94**	**10.97**	**15.34**	**21.80**	**30.19**	**40.63**	**52.25**
2006	2.67	7.06	6.25	5.98	**6.57**	**9.29**	**8.79**	**10.13**	**11.09**	**11.43**	**15.46**	**22.14**	**30.77**	**42.19**	**58.65**
2007	0.59	7.04	7.71	**7.67**	**9.72**	**8.99**	**10.63**	**11.77**	**11.49**	**11.98**	**16.31**	**23.30**	**32.51**	**46.83**	**59.03**
2008	1.11	6.03	**6.87**	**8.65**	**8.56**	**9.40**	**10.47**	**10.26**	**9.98**	**10.04**	**13.30**	**20.04**	**30.22**	**40.77**	**52.53**
2009	0.76	**3.83**	**5.63**	**6.83**	**7.88**	**9.02**	**9.04**	**8.85**	**8.58**	**8.59**	**11.54**	**17.46**	**24.58**	**33.55**	**44.24**
2010	**0.92**	**4.39**	**5.95**	**7.48**	**8.94**	**9.24**	**9.15**	**8.90**	**8.62**	**8.92**	**12.49**	**18.07**	**25.39**	**34.64**	**45.39**
2011	**1.93**	**6.29**	**9.56**	**13.11**	**14.02**	**14.06**	**13.65**	**13.52**	**13.37**	**14.28**	**19.59**	**27.37**	**37.11**	**48.42**	**60.34**
2012	**3.02**	**10.07**	**15.24**	**17.88**	**18.47**	**18.03**	**17.48**	**17.29**	**17.82**	**18.60**	**24.57**	**33.55**	**44.17**	**55.72**	**66.78**
2013	**3.25**	**10.46**	**13.85**	**16.00**	**16.44**	**16.32**	**16.12**	**16.28**	**15.82**	**16.24**	**21.65**	**29.95**	**40.03**	**51.10**	**62.75**
2014	**3.47**	**9.98**	**12.62**	**14.26**	**15.27**	**15.51**	**15.36**	**15.50**	**15.00**	**15.39**	**20.27**	**27.93**	**37.00**	**48.00**	**59.66**
2015	**3.70**	**9.98**	**12.52**	**14.18**	**14.47**	**15.25**	**15.07**	**14.54**	**14.03**	**14.49**	**19.44**	**26.91**	**36.31**	**47.31**	**59.07**
2016	**3.52**	**10.08**	**12.74**	**14.41**	**15.19**	**14.97**	**14.46**	**13.93**	**13.41**	**13.80**	**18.46**	**25.84**	**35.20**	**46.24**	**58.18**
2017	**3.54**	**10.20**	**12.87**	**14.63**	**15.36**	**14.98**	**14.42**	**13.87**	**13.33**	**13.59**	**18.01**	**25.12**	**34.07**	**44.65**	**56.37**

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
1991	0.02	0.12	0.39	0.65	0.87	0.89	0.99	1.01	1.06	1.09	1.09	1.09	1.09	1.11	1.18
1992	0.00	0.07	0.19	0.35	0.48	0.56	0.69	0.77	0.80	0.84	0.85	0.86	0.86	0.86	0.86
1993	0.00	0.05	0.15	0.27	0.39	0.49	0.55	0.62	0.67	0.69	0.70	0.71	0.71	0.72	0.72
1994	0.01	0.08	0.26	0.46	0.65	0.79	0.90	0.94	0.99	1.02	1.03	1.05	1.05	1.06	1.06
1995	0.04	0.26	0.58	1.00	1.29	1.50	1.65	1.75	1.79	1.80	1.82	1.84	1.84	1.84	1.85
1996	0.00	0.09	0.27	0.52	0.83	1.04	1.16	1.22	1.30	1.34	1.36	1.37	1.37	1.38	**1.38**
1997	0.00	0.10	0.32	0.57	0.81	0.96	1.05	1.13	1.17	1.20	1.21	1.21	1.21	**1.21**	**1.22**
1998	0.01	0.02	0.16	0.29	0.45	0.55	0.60	0.66	0.66	0.69	0.69	0.72	**0.74**	**0.76**	**0.77**
1999	0.00	0.05	0.13	0.23	0.34	0.42	0.49	0.53	0.55	0.56	0.58	**0.60**	**0.62**	**0.63**	**0.64**
2000	0.00	0.08	0.20	0.38	0.58	0.64	0.72	0.78	0.84	0.92	**1.01**	**1.04**	**1.07**	**1.08**	**1.08**
2001	0.00	0.05	0.16	0.29	0.53	0.64	0.69	0.75	0.83	**0.92**	**0.97**	**1.00**	**1.02**	**1.03**	**1.03**
2002	0.00	0.04	0.20	0.31	0.39	0.46	0.51	0.56	**0.61**	**0.68**	**0.72**	**0.74**	**0.75**	**0.76**	**0.76**
2003	0.00	0.04	0.13	0.25	0.33	0.43	0.52	**0.65**	**0.76**	**0.84**	**0.87**	**0.89**	**0.90**	**0.90**	**0.90**
2004	0.01	0.07	0.21	0.32	0.44	0.60	**0.83**	**1.01**	**1.14**	**1.19**	**1.22**	**1.24**	**1.24**	**1.25**	**1.25**
2005	0.01	0.10	0.22	0.38	0.67	**1.13**	**1.56**	**1.87**	**2.02**	**2.09**	**2.13**	**2.15**	**2.16**	**2.17**	**2.17**
2006	0.00	0.05	0.15	0.48	**1.00**	**1.98**	**2.66**	**2.99**	**3.16**	**3.26**	**3.31**	**3.34**	**3.36**	**3.37**	**3.37**
2007	0.00	0.12	0.36	**0.96**	**2.20**	**3.12**	**3.55**	**3.78**	**3.91**	**3.98**	**4.03**	**4.06**	**4.07**	**4.08**	**4.08**
2008	0.00	0.04	**0.87**	**3.23**	**4.83**	**5.53**	**5.85**	**6.04**	**6.16**	**6.23**	**6.28**	**6.31**	**6.33**	**6.34**	**6.34**
2009	0.00	**0.09**	**1.15**	**2.29**	**2.94**	**3.28**	**3.49**	**3.62**	**3.71**	**3.78**	**3.82**	**3.84**	**3.86**	**3.87**	**3.87**
2010	**0.02**	**0.49**	**1.40**	**2.06**	**2.48**	**2.73**	**2.89**	**2.99**	**3.07**	**3.12**	**3.15**	**3.17**	**3.18**	**3.19**	**3.19**
2011	**0.10**	**0.64**	**1.45**	**2.18**	**2.71**	**3.03**	**3.23**	**3.36**	**3.45**	**3.51**	**3.55**	**3.57**	**3.58**	**3.58**	**3.59**
2012	**0.09**	**0.55**	**1.41**	**2.25**	**2.84**	**3.21**	**3.44**	**3.59**	**3.69**	**3.75**	**3.79**	**3.81**	**3.82**	**3.82**	**3.83**
2013	**0.05**	**0.39**	**1.06**	**1.73**	**2.20**	**2.50**	**2.70**	**2.83**	**2.92**	**2.97**	**3.00**	**3.02**	**3.03**	**3.03**	**3.03**
2014	**0.05**	**0.36**	**0.95**	**1.52**	**1.95**	**2.24**	**2.42**	**2.54**	**2.61**	**2.66**	**2.69**	**2.71**	**2.72**	**2.72**	**2.72**
2015	**0.05**	**0.35**	**0.91**	**1.47**	**1.87**	**2.14**	**2.32**	**2.42**	**2.49**	**2.54**	**2.56**	**2.58**	**2.59**	**2.59**	**2.60**
2016	**0.05**	**0.35**	**0.89**	**1.44**	**1.83**	**2.08**	**2.23**	**2.33**	**2.40**	**2.44**	**2.47**	**2.49**	**2.50**	**2.51**	**2.51**
2017	**0.04**	**0.29**	**0.77**	**1.24**	**1.57**	**1.79**	**1.93**	**2.02**	**2.08**	**2.12**	**2.15**	**2.17**	**2.18**	**2.18**	**2.18**

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
1991	1.13	10.83	34.08	53.26	57.67	63.24	66.88	72.79	77.91	81.04	83.96	86.78	89.87	91.80	93.75
1992	1.31	13.00	29.40	34.78	42.52	48.52	56.41	64.19	68.22	72.89	78.39	83.39	86.94	89.71	92.62
1993	2.05	10.62	16.25	24.27	31.49	40.94	50.79	56.43	62.58	69.94	77.82	82.48	85.90	89.05	92.25
1994	2.08	6.45	13.52	20.56	29.73	39.62	45.69	52.57	60.48	69.69	75.75	80.12	84.00	87.15	92.50
1995	2.85	11.35	18.71	28.48	38.83	44.71	51.09	58.92	66.77	72.07	76.12	79.54	82.69	86.47	93.48
1996	1.34	6.22	15.50	27.36	34.23	42.47	52.39	64.75	72.33	76.93	80.95	83.70	86.22	88.81	**92.05**
1997	1.91	11.25	23.91	30.21	37.81	48.90	61.50	69.25	74.48	78.25	81.24	83.51	85.93	**88.83**	**93.26**
1998	1.66	9.24	15.26	23.81	35.82	53.81	63.73	69.68	74.36	77.70	80.78	83.09	**85.83**	**90.33**	**94.44**
1999	1.77	6.24	14.18	25.93	44.49	55.67	62.80	68.03	71.76	74.92	77.75	**80.63**	**85.52**	**90.58**	**95.74**
2000	2.45	12.00	25.45	43.67	56.37	63.48	68.95	73.05	75.62	77.90	**80.32**	**83.75**	**87.89**	**93.40**	**97.11**
2001	1.70	14.08	43.12	57.67	66.32	70.92	74.22	76.73	78.81	**80.68**	**82.90**	**85.81**	**90.03**	**94.31**	**97.09**
2002	2.83	24.40	39.01	49.36	55.84	60.32	63.85	66.83	**69.67**	**72.59**	**76.18**	**81.47**	**87.69**	**93.04**	**96.67**
2003	4.45	14.48	25.62	34.11	40.34	45.05	49.12	**53.01**	**57.22**	**61.03**	**66.30**	**73.40**	**81.16**	**88.49**	**94.12**
2004	3.36	12.66	21.85	28.49	33.37	37.26	**41.50**	**46.49**	**50.76**	**55.61**	**62.41**	**70.56**	**79.35**	**87.50**	**93.14**
2005	2.72	10.36	17.60	22.76	26.59	**31.26**	**37.37**	**42.45**	**47.42**	**52.97**	**59.86**	**68.15**	**77.12**	**85.53**	**91.96**
2006	2.67	9.54	15.19	20.25	**25.46**	**32.29**	**38.07**	**44.07**	**49.94**	**55.30**	**61.71**	**69.45**	**77.82**	**85.76**	**92.14**
2007	0.59	7.59	14.71	**21.22**	**28.79**	**34.99**	**41.57**	**48.03**	**53.57**	**58.66**	**64.75**	**72.03**	**79.80**	**87.35**	**92.41**
2008	1.11	7.07	**13.45**	**20.85**	**27.35**	**33.73**	**40.09**	**45.64**	**50.46**	**54.81**	**59.99**	**66.75**	**74.89**	**82.55**	**88.39**
2009	0.76	**4.56**	**9.93**	**16.00**	**22.44**	**29.17**	**35.28**	**40.70**	**45.48**	**49.84**	**55.19**	**62.35**	**70.66**	**79.21**	**86.70**
2010	**0.92**	**5.27**	**10.88**	**17.44**	**24.63**	**31.37**	**37.40**	**42.72**	**47.40**	**51.81**	**57.44**	**64.56**	**72.75**	**81.09**	**88.22**
2011	**1.93**	**8.09**	**16.82**	**27.53**	**37.39**	**45.81**	**52.80**	**58.74**	**63.81**	**68.48**	**73.97**	**80.12**	**86.18**	**91.14**	**94.32**
2012	**3.02**	**12.78**	**25.99**	**38.97**	**49.83**	**58.36**	**65.08**	**70.52**	**75.14**	**79.07**	**83.29**	**87.63**	**91.41**	**94.07**	**95.48**
2013	**3.25**	**13.36**	**25.30**	**37.09**	**47.15**	**55.41**	**62.20**	**67.91**	**72.54**	**76.53**	**80.97**	**85.77**	**90.26**	**93.69**	**95.75**
2014	**3.47**	**13.10**	**24.02**	**34.72**	**44.46**	**52.77**	**59.68**	**65.55**	**70.34**	**74.50**	**79.13**	**84.21**	**89.05**	**93.00**	**95.55**
2015	**3.70**	**13.31**	**24.12**	**34.75**	**43.98**	**52.24**	**59.11**	**64.72**	**69.33**	**73.41**	**78.09**	**83.29**	**88.42**	**92.68**	**95.47**
2016	**3.52**	**13.24**	**24.25**	**35.04**	**44.69**	**52.69**	**59.23**	**64.60**	**69.03**	**72.98**	**77.51**	**82.68**	**87.90**	**92.34**	**95.34**
2017	**3.54**	**13.37**	**24.49**	**35.42**	**45.15**	**53.13**	**59.63**	**64.96**	**69.36**	**73.24**	**77.68**	**82.75**	**87.89**	**92.32**	**95.42**

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
1990	0.00	0.38	0.88	1.35	1.51	1.05	1.63	1.52	1.68	1.23	1.02	0.82	0.66	0.28	0.51	0.21	0.47	0.00	0.30	0.00	**0.37**	**0.14**	**0.13**	**0.12**	**0.11**	**0.10**	**0.09**	**0.07**	**0.06**	**0.06**
1991	0.02	0.18	0.73	0.94	1.21	1.43	1.83	1.74	1.53	1.50	0.75	0.48	0.56	0.43	0.15	0.12	0.22	0.17	0.19	**0.36**	**0.27**	**0.21**	**0.19**	**0.15**	**0.12**	**0.10**	**0.08**	**0.07**	**0.07**	**0.06**
1992	0.01	0.22	0.74	1.08	1.47	2.16	2.15	1.67	1.49	0.83	0.62	0.58	0.45	0.30	0.28	0.07	0.16	0.32	**0.25**	**0.26**	**0.22**	**0.20**	**0.16**	**0.13**	**0.11**	**0.09**	**0.08**	**0.08**	**0.07**	**0.06**
1993	0.01	0.26	0.79	1.37	2.26	2.18	1.86	1.69	1.00	0.78	0.90	0.52	0.34	0.28	0.38	0.38	0.47	**0.52**	**0.35**	**0.29**	**0.26**	**0.20**	**0.17**	**0.14**	**0.12**	**0.10**	**0.10**	**0.09**	**0.08**	**0.07**
1994	0.01	0.25	0.94	2.07	2.45	2.28	1.88	1.15	0.93	0.95	0.73	0.46	0.34	0.24	0.30	0.39	**0.60**	**0.43**	**0.36**	**0.33**	**0.26**	**0.22**	**0.18**	**0.15**	**0.13**	**0.13**	**0.12**	**0.10**	**0.09**	**0.08**
1995	0.02	0.47	1.96	3.22	3.57	2.80	1.81	1.73	2.05	1.61	1.03	0.95	0.61	0.73	0.84	**1.01**	**0.80**	**0.60**	**0.51**	**0.39**	**0.30**	**0.24**	**0.20**	**0.16**	**0.16**	**0.14**	**0.12**	**0.11**	**0.09**	**0.08**
1996	0.01	0.49	1.92	3.64	3.85	2.71	2.74	3.27	2.16	1.52	1.20	0.84	1.38	1.29	**1.17**	**1.30**	**1.06**	**0.97**	**0.79**	**0.67**	**0.58**	**0.49**	**0.42**	**0.42**	**0.38**	**0.34**	**0.31**	**0.27**	**0.24**	**0.21**
1997	0.03	0.66	2.30	3.36	2.97	3.29	3.61	2.63	1.67	1.45	1.13	1.50	1.47	**1.65**	**1.47**	**1.20**	**1.12**	**0.92**	**0.78**	**0.68**	**0.57**	**0.50**	**0.50**	**0.45**	**0.41**	**0.37**	**0.34**	**0.30**	**0.26**	**0.23**
1998	0.07	1.01	2.41	2.60	3.43	4.07	3.00	2.07	1.70	1.64	1.86	1.97	**2.10**	**1.78**	**1.48**	**1.38**	**1.12**	**0.92**	**0.82**	**0.70**	**0.62**	**0.62**	**0.56**	**0.51**	**0.47**	**0.42**	**0.37**	**0.33**	**0.29**	**0.25**
1999	0.03	0.35	1.00	2.11	3.33	3.01	2.21	1.82	1.68	1.59	2.82	**2.67**	**2.10**	**1.68**	**1.56**	**1.31**	**1.16**	**1.03**	**0.87**	**0.76**	**0.77**	**0.70**	**0.63**	**0.59**	**0.53**	**0.47**	**0.41**	**0.37**	**0.31**	**0.26**
2000	0.02	0.57	1.82	3.52	3.15	2.51	2.10	2.32	3.05	3.45	**3.02**	**2.86**	**2.27**	**2.02**	**1.65**	**1.37**	**1.21**	**1.03**	**0.93**	**0.94**	**0.86**	**0.78**	**0.73**	**0.66**	**0.59**	**0.52**	**0.47**	**0.40**	**0.33**	**0.27**
2001	0.06	0.73	2.01	2.48	2.17	2.38	2.13	2.84	3.58	**3.88**	**3.40**	**2.85**	**2.56**	**1.98**	**1.73**	**1.56**	**1.34**	**1.19**	**1.21**	**1.11**	**1.01**	**0.94**	**0.85**	**0.76**	**0.67**	**0.60**	**0.51**	**0.42**	**0.34**	**0.29**
2002	0.01	0.33	1.66	1.91	2.30	2.88	4.63	5.24	**5.29**	**5.46**	**4.33**	**3.75**	**2.85**	**2.19**	**1.87**	**1.59**	**1.42**	**1.44**	**1.33**	**1.21**	**1.14**	**1.04**	**0.93**	**0.82**	**0.75**	**0.63**	**0.52**	**0.44**	**0.36**	**0.31**
2003	0.03	0.64	1.50	2.24	3.49	5.14	5.81	**5.79**	**6.57**	**5.34**	**4.82**	**3.71**	**2.71**	**2.24**	**1.91**	**1.72**	**1.75**	**1.61**	**1.48**	**1.38**	**1.26**	**1.13**	**0.99**	**0.90**	**0.76**	**0.63**	**0.52**	**0.44**	**0.37**	**0.31**
2004	0.06	0.57	1.67	3.21	5.61	6.37	**6.61**	**8.96**	**7.20**	**6.33**	**4.97**	**3.98**	**3.24**	**2.59**	**2.28**	**2.29**	**2.09**	**1.90**	**1.78**	**1.62**	**1.45**	**1.28**	**1.16**	**0.98**	**0.82**	**0.68**	**0.57**	**0.48**	**0.40**	**0.33**
2005	0.05	0.82	2.60	5.12	6.31	**7.51**	**10.45**	**8.50**	**7.45**	**5.69**	**4.57**	**3.76**	**2.91**	**2.38**	**2.29**	**2.03**	**1.81**	**1.65**	**1.46**	**1.28**	**1.10**	**0.98**	**0.82**	**0.67**	**0.56**	**0.46**	**0.39**	**0.32**	**0.27**	**0.22**
2006	0.03	1.25	3.51	6.58	**9.33**	**11.71**	**9.87**	**9.03**	**6.94**	**5.64**	**4.67**	**3.69**	**3.05**	**2.86**	**2.49**	**2.18**	**1.95**	**1.70**	**1.46**	**1.25**	**1.11**	**0.92**	**0.75**	**0.62**	**0.51**	**0.43**	**0.36**	**0.30**	**0.25**	**0.21**
2007	0.02	1.27	5.05	**10.59**	**13.08**	**11.48**	**10.60**	**8.09**	**6.58**	**5.72**	**4.63**	**3.95**	**3.73**	**3.23**	**2.89**	**2.55**	**2.20**	**1.85**	**1.58**	**1.39**	**1.14**	**0.90**	**0.74**	**0.61**	**0.50**	**0.42**	**0.35**	**0.29**	**0.25**	**0.21**
2008	0.01	0.73	**4.97**	**10.85**	**10.05**	**9.56**	**7.39**	**6.11**	**5.49**	**4.50**	**3.87**	**3.59**	**3.11**	**2.78**	**2.52**	**2.21**	**1.83**	**1.57**	**1.39**	**1.14**	**0.93**	**0.77**	**0.64**	**0.54**	**0.45**	**0.38**	**0.32**	**0.27**	**0.23**	**0.19**
2009	0.11	**1.15**	**4.71**	**5.96**	**6.26**	**5.21**	**4.54**	**4.09**	**3.45**	**2.99**	**2.91**	**2.63**	**2.39**	**2.18**	**1.90**	**1.62**	**1.40**	**1.27**	**1.06**	**0.86**	**0.71**	**0.58**	**0.48**	**0.40**	**0.33**	**0.28**	**0.23**	**0.19**	**0.16**	**0.13**
2010	**0.03**	**1.04**	**2.86**	**4.09**	**4.07**	**3.83**	**3.53**	**3.04**	**2.66**	**2.78**	**2.65**	**2.43**	**2.27**	**1.99**	**1.79**	**1.60**	**1.47**	**1.23**	**1.00**	**0.82**	**0.67**	**0.56**	**0.46**	**0.38**	**0.31**	**0.26**	**0.21**	**0.17**	**0.14**	**0.12**
2011	**0.07**	**0.84**	**2.30**	**3.80**	**4.78**	**4.77**	**4.38**	**3.90**	**3.74**	**3.36**	**2.11**	**1.88**	**1.81**	**1.70**	**1.56**	**1.46**	**1.25**	**1.05**	**0.86**	**0.70**	**0.58**	**0.49**	**0.46**	**0.38**	**0.31**	**0.26**	**0.21**	**0.22**	**0.24**	**0.18**
2012	**0.08**	**1.06**	**3.05**	**4.96**	**5.63**	**5.44**	**4.92**	**4.75**	**4.20**	**2.76**	**2.53**	**2.54**	**2.13**	**1.80**	**1.65**	**1.40**	**1.16**	**0.96**	**0.79**	**0.66**	**0.55**	**0.52**	**0.44**	**0.36**	**0.29**	**0.24**	**0.25**	**0.27**	**0.21**	**0.16**
2013	**0.09**	**1.11**	**3.57**	**5.79**	**6.78**	**6.55**	**6.20**	**5.41**	**3.57**	**3.46**	**3.31**	**2.76**	**2.36**	**2.17**	**1.84**	**1.51**	**1.26**	**1.05**	**0.88**	**0.74**	**0.70**	**0.59**	**0.48**	**0.40**	**0.33**	**0.34**	**0.37**	**0.28**	**0.22**	**0.17**
2014	**0.08**	**0.98**	**3.32**	**5.68**	**6.74**	**6.82**	**6.08**	**4.19**	**3.72**	**3.77**	**3.43**	**2.82**	**2.48**	**2.10**	**1.74**	**1.45**	**1.22**	**1.02**	**0.86**	**0.83**	**0.69**	**0.56**	**0.47**	**0.39**	**0.39**	**0.44**	**0.34**	**0.26**	**0.21**	**0.17**
2015	**0.08**	**0.99**	**3.35**	**5.76**	**7.03**	**6.61**	**4.83**	**4.47**	**4.74**	**4.47**	**3.77**	**3.17**	**2.65**	**2.21**	**1.85**	**1.57**	**1.33**	**1.13**	**1.09**	**0.92**	**0.76**	**0.63**	**0.53**	**0.54**	**0.60**	**0.47**	**0.37**	**0.30**	**0.24**	**0.20**
2016	**0.08**	**1.07**	**3.66**	**6.40**	**7.27**	**5.81**	**5.46**	**5.68**	**5.42**	**5.01**	**4.23**	**3.29**	**2.64**	**2.23**	**1.73**	**1.45**	**1.22**	**1.16**	**0.97**	**0.79**	**0.65**	**0.54**	**0.56**	**0.61**	**0.47**	**0.37**	**0.29**	**0.23**	**0.19**	**0.15**
2017	**0.10**	**1.16**	**3.80**	**6.04**	**6.03**	**5.93**	**6.42**	**6.12**	**5.23**	**4.68**	**3.68**	**2.93**	**2.43**	**2.03**	**1.70**	**1.41**	**1.34**	**1.11**	**0.91**	**0.75**	**0.62**	**0.63**	**0.70**	**0.54**	**0.43**	**0.34**	**0.27**	**0.22**	**0.18**	**0.15**

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
1990	0.47	2.62	6.00	11.51	12.20	8.78	13.62	10.84	17.40	16.13	12.54	17.14	19.34	19.06	16.10	11.50	14.88	9.07	7.55	7.54	**3.20**	**4.20**	**4.05**	**7.70**	**11.25**	**13.43**	**10.45**	**9.98**	**12.84**	**14.23**
1991	0.38	2.51	7.13	9.80	7.66	11.97	12.00	17.26	18.82	12.82	20.81	22.37	23.87	19.82	15.19	20.53	14.17	8.49	7.62	**3.85**	**4.58**	**4.42**	**8.09**	**11.44**	**13.65**	**11.07**	**10.57**	**13.59**	**15.05**	**16.38**
1992	0.38	3.54	7.20	7.39	13.26	12.28	19.82	20.11	13.19	20.82	22.95	25.67	20.94	16.36	16.54	14.12	10.35	5.67	**4.85**	**4.91**	**4.78**	**8.42**	**11.28**	**13.67**	**11.90**	**11.38**	**14.59**	**16.12**	**17.51**	**18.60**
1993	0.89	4.52	6.17	13.31	11.66	19.91	20.54	12.92	23.25	25.35	27.84	23.38	18.84	16.74	15.94	10.72	5.85	**5.01**	**5.09**	**4.96**	**8.64**	**11.57**	**14.47**	**12.25**	**11.71**	**14.96**	**16.53**	**17.96**	**19.07**	**18.25**
1994	0.58	2.89	10.25	11.43	21.04	20.53	13.14	24.75	26.30	29.64	25.12	20.67	18.69	16.37	10.60	5.54	**4.69**	**5.28**	**5.15**	**9.01**	**12.05**	**14.75**	**12.73**	**12.18**	**15.56**	**17.17**	**18.64**	**19.79**	**18.95**	**18.15**
1995	2.02	10.77	14.62	27.37	21.78	13.19	24.25	25.21	27.49	25.14	22.39	20.54	17.28	10.49	4.99	**4.05**	**5.55**	**5.47**	**9.54**	**12.76**	**15.35**	**13.05**	**12.49**	**15.90**	**17.53**	**19.03**	**20.19**	**19.34**	**18.53**	**17.75**
1996	1.08	6.93	32.54	30.55	15.42	28.74	25.94	26.53	25.27	22.58	20.63	18.53	11.37	5.35	**4.56**	**6.99**	**6.97**	**12.08**	**15.79**	**19.40**	**16.60**	**15.95**	**19.99**	**21.80**	**23.47**	**24.70**	**23.63**	**22.64**	**21.72**	**20.86**
1997	1.85	22.54	32.68	17.17	32.57	25.22	25.56	23.97	21.35	20.98	18.75	11.82	5.19	**4.77**	**7.24**	**7.25**	**12.56**	**16.43**	**19.96**	**17.21**	**16.54**	**20.67**	**22.49**	**24.16**	**25.38**	**24.24**	**23.20**	**22.24**	**21.34**	**17.37**
1998	5.92	24.74	17.81	37.48	28.30	26.91	25.34	23.57	22.11	19.98	12.42	6.37	**4.57**	**7.36**	**7.43**	**12.63**	**15.97**	**19.74**	**17.58**	**16.91**	**21.05**	**22.85**	**24.50**	**25.68**	**24.50**	**23.44**	**22.46**	**21.54**	**17.55**	**15.98**
1999	2.13	5.01	30.44	29.39	28.79	24.64	25.78	26.04	25.32	16.68	7.05	**5.27**	**7.86**	**7.85**	**13.95**	**18.53**	**22.77**	**18.84**	**18.11**	**22.52**	**24.39**	**26.07**	**27.25**	**25.95**	**24.79**	**23.74**	**22.76**	**18.57**	**16.93**	**16.31**
2000	1.34	31.44	29.18	27.53	23.29	25.88	25.16	25.34	16.28	6.36	**5.31**	**7.60**	**7.81**	**13.77**	**17.41**	**21.06**	**19.05**	**18.32**	**22.74**	**24.56**	**26.20**	**27.32**	**25.98**	**24.79**	**23.72**	**22.73**	**18.56**	**16.94**	**16.33**	**15.71**
2001	12.11	22.14	27.64	23.47	27.41	28.28	28.39	16.61	7.33	**4.70**	**7.00**	**7.13**	**13.44**	**18.68**	**23.25**	**19.57**	**18.84**	**23.34**	**25.21**	**26.88**	**28.01**	**26.65**	**25.46**	**24.40**	**23.42**	**19.19**	**17.56**	**16.97**	**16.37**	**15.77**
2002	3.71	26.30	22.47	29.23	30.38	31.83	19.27	7.18	**5.50**	**6.32**	**6.55**	**12.48**	**17.74**	**22.88**	**20.23**	**19.54**	**24.20**	**26.04**	**27.69**	**28.77**	**27.31**	**26.02**	**24.88**	**23.83**	**19.52**	**17.85**	**17.23**	**16.60**	**15.98**	**15.36**
2003	9.07	18.40	30.26	32.85	32.50	18.85	7.07	**4.80**	**5.92**	**6.17**	**11.51**	**16.11**	**21.17**	**20.18**	**19.59**	**24.29**	**26.15**	**27.84**	**28.90**	**27.46**	**26.19**	**25.06**	**24.03**	**19.73**	**18.10**	**17.50**	**16.90**	**16.29**	**15.69**	**15.10**
2004	4.28	24.80	31.85	33.40	19.39	7.21	**4.65**	**5.27**	**5.53**	**10.81**	**15.59**	**20.27**	**18.90**	**19.09**	**23.87**	**25.75**	**27.39**	**28.44**	**26.99**	**25.72**	**24.59**	**23.57**	**19.35**	**17.77**	**17.20**	**16.62**	**16.03**	**15.44**	**14.87**	**13.54**
2005	5.52	17.94	22.73	18.90	6.89	**4.07**	**4.04**	**4.23**	**8.50**	**13.23**	**17.47**	**16.06**	**16.69**	**21.83**	**24.00**	**25.84**	**26.90**	**25.54**	**24.42**	**23.42**	**22.55**	**18.50**	**17.01**	**16.45**	**15.87**	**15.29**	**14.72**	**14.16**	**13.62**	**12.63**
2006	2.84	12.34	17.11	13.49	**4.88**	**3.52**	**3.65**	**7.22**	**10.98**	**14.97**	**14.40**	**15.09**	**20.02**	**22.50**	**24.66**	**26.07**	**25.00**	**24.15**	**23.30**	**22.50**	**18.48**	**17.08**	**16.57**	**16.03**	**15.46**	**14.89**	**14.33**	**13.78**	**13.25**	**12.74**
2007	1.78	11.20	18.01	**10.89**	**3.60**	**3.56**	**7.11**	**10.88**	**15.11**	**14.24**	**14.86**	**19.56**	**22.12**	**24.40**	**25.87**	**24.95**	**24.22**	**23.69**	**22.90**	**18.97**	**17.59**	**17.38**	**16.85**	**16.32**	**15.77**	**15.19**	**14.59**	**14.01**	**13.45**	**12.91**
2008	0.81	22.91	**14.46**	**5.14**	**4.34**	**8.16**	**12.59**	**17.56**	**15.71**	**16.43**	**21.57**	**25.01**	**28.21**	**29.95**	**29.09**	**28.24**	**28.19**	**27.20**	**22.60**	**20.95**	**20.29**	**19.53**	**18.71**	**17.92**	**17.15**	**16.40**	**15.69**	**15.00**	**14.34**	**13.71**
2009	13.13	**13.95**	**6.90**	**6.55**	**11.18**	**16.34**	**21.56**	**19.00**	**19.41**	**25.64**	**29.17**	**32.08**	**34.10**	**33.47**	**33.15**	**32.46**	**31.19**	**25.80**	**23.60**	**22.74**	**21.88**	**21.03**	**20.20**	**19.40**	**18.62**	**17.87**	**17.14**	**16.44**	**15.77**	**15.12**
2010	**1.79**	**7.44**	**8.20**	**15.26**	**20.71**	**23.92**	**21.91**	**22.23**	**29.33**	**32.47**	**35.21**	**37.55**	**36.55**	**36.12**	**34.72**	**33.10**	**27.33**	**25.09**	**24.23**	**23.39**	**22.54**	**21.70**	**20.89**	**20.09**	**19.31**	**18.55**	**17.81**	**17.10**	**16.41**	**15.48**
2011	**3.80**	**9.17**	**23.39**	**34.97**	**30.95**	**30.11**	**29.94**	**30.89**	**32.25**	**37.98**	**45.36**	**42.71**	**41.00**	**38.69**	**36.56**	**30.51**	**28.26**	**27.31**	**26.67**	**26.11**	**25.30**	**24.50**	**18.92**	**17.72**	**17.15**	**16.58**	**16.01**	**15.15**	**14.28**	**13.87**
2012	**6.33**	**26.30**	**37.75**	**34.66**	**30.05**	**28.94**	**29.52**	**30.59**	**35.55**	**42.93**	**39.54**	**36.88**	**36.73**	**36.05**	**30.43**	**28.39**	**27.63**	**26.90**	**26.27**	**25.48**	**24.68**	**19.01**	**17.90**	**17.34**	**16.76**	**16.19**	**15.31**	**14.42**	**14.01**	**13.55**
2013	**9.83**	**32.96**	**37.30**	**34.00**	**28.64**	**28.63**	**30.10**	**36.11**	**41.89**	**38.34**	**36.88**	**36.98**	**36.03**	**30.63**	**28.82**	**28.30**	**27.61**	**26.89**	**26.16**	**25.43**	**19.76**	**18.62**	**18.08**	**17.54**	**16.97**	**16.05**	**15.12**	**14.73**	**14.28**	**13.81**
2014	**9.96**	**31.40**	**36.25**	**32.65**	**28.40**	**29.18**	**34.36**	**40.40**	**37.96**	**35.10**	**33.96**	**34.03**	**29.41**	**27.73**	**27.28**	**26.68**	**26.01**	**25.34**	**24.66**	**18.98**	**18.12**	**17.63**	**17.11**	**16.59**	**15.75**	**14.77**	**14.43**	**14.02**	**13.57**	**13.10**
2015	**8.97**	**30.66**	**36.00**	**33.78**	**30.78**	**36.13**	**42.22**	**39.06**	**35.67**	**33.99**	**34.31**	**30.78**	**29.43**	**28.91**	**28.31**	**27.61**	**26.92**	**26.19**	**20.53**	**19.36**	**18.87**	**18.33**	**17.80**	**16.89**	**15.97**	**15.63**	**15.21**	**14.74**	**14.26**	**13.76**
2016	**8.08**	**29.23**	**35.68**	**34.67**	**35.40**	**40.93**	**37.54**	**34.99**	**32.97**	**31.43**	**28.85**	**29.13**	**29.21**	**28.48**	**29.08**	**28.46**	**27.82**	**21.98**	**20.78**	**20.31**	**19.79**	**19.24**	**18.30**	**17.38**	**17.05**	**16.62**	**16.14**	**15.63**	**15.11**	**14.59**
2017	**8.65**	**31.91**	**38.53**	**41.18**	**43.16**	**37.98**	**35.18**	**33.62**	**33.70**	**29.70**	**29.82**	**30.07**	**29.52**	**28.89**	**28.18**	**27.61**	**21.75**	**20.69**	**20.16**	**19.60**	**19.03**	**18.04**	**16.96**	**16.62**	**16.20**	**15.72**	**15.22**	**14.71**	**14.20**	**13.69**

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
1990	0.00	0.38	1.23	2.44	3.63	4.34	5.34	6.12	6.88	7.33	7.64	7.85	8.00	8.04	8.11	8.14	8.19	8.19	8.21	8.21	**8.23**	**8.24**	**8.25**	**8.26**	**8.26**	**8.27**	**8.27**	**8.27**	**8.28**	**8.28**
1991	0.02	0.20	0.91	1.75	2.72	3.76	4.91	5.85	6.53	7.05	7.27	7.39	7.49	7.55	7.56	7.57	7.59	7.60	7.61	**7.63**	**7.64**	**7.65**	**7.66**	**7.67**	**7.67**	**7.68**	**7.68**	**7.68**	**7.68**	**7.68**
1992	0.01	0.23	0.93	1.88	3.07	4.56	5.83	6.60	7.13	7.39	7.54	7.65	7.71	7.74	7.76	7.77	7.78	7.80	**7.81**	**7.82**	**7.83**	**7.84**	**7.85**	**7.86**	**7.86**	**7.86**	**7.86**	**7.87**	**7.87**	**7.87**
1993	0.01	0.27	1.01	2.21	3.90	5.31	6.24	6.90	7.24	7.43	7.60	7.67	7.70	7.73	7.75	7.78	7.80	**7.82**	**7.84**	**7.85**	**7.86**	**7.87**	**7.87**	**7.88**	**7.88**	**7.88**	**7.89**	**7.89**	**7.89**	**7.89**
1994	0.01	0.25	1.16	2.93	4.74	6.03	6.85	7.28	7.54	7.73	7.83	7.87	7.90	7.92	7.93	7.95	**7.98**	**8.00**	**8.02**	**8.03**	**8.04**	**8.04**	**8.05**	**8.05**	**8.05**	**8.06**	**8.06**	**8.06**	**8.06**	**8.06**
1995	0.02	0.48	2.19	4.53	6.32	7.38	7.95	8.35	8.70	8.90	8.99	9.05	9.08	9.11	9.15	**9.18**	**9.21**	**9.23**	**9.25**	**9.26**	**9.26**	**9.27**	**9.27**	**9.27**	**9.28**	**9.28**	**9.28**	**9.28**	**9.28**	**9.28**
1996	0.01	0.49	2.25	4.43	5.95	6.82	7.42	7.93	8.16	8.28	8.36	8.39	8.45	8.49	**8.53**	**8.56**	**8.59**	**8.62**	**8.63**	**8.65**	**8.65**	**8.66**	**8.66**	**8.67**	**8.67**	**8.67**	**8.67**	**8.67**	**8.67**	**8.67**
1997	0.03	0.67	2.41	4.06	5.21	6.04	6.69	7.02	7.18	7.28	7.34	7.41	7.47	**7.53**	**7.58**	**7.61**	**7.65**	**7.67**	**7.68**	**7.69**	**7.70**	**7.71**	**7.71**	**7.71**	**7.72**	**7.72**	**7.72**	**7.72**	**7.72**	**7.72**
1998	0.07	1.02	2.70	4.15	5.29	6.22	6.69	6.92	7.07	7.17	7.27	7.35	**7.43**	**7.50**	**7.55**	**7.59**	**7.62**	**7.64**	**7.65**	**7.66**	**7.67**	**7.67**	**7.68**	**7.68**	**7.68**	**7.68**	**7.68**	**7.69**	**7.69**	**7.69**
1999	0.03	0.37	1.30	2.63	4.08	4.97	5.45	5.73	5.91	6.04	6.23	**6.39**	**6.50**	**6.59**	**6.66**	**6.71**	**6.74**	**6.76**	**6.78**	**6.79**	**6.80**	**6.81**	**6.81**	**6.81**	**6.82**	**6.82**	**6.82**	**6.82**	**6.82**	**6.82**
2000	0.02	0.58	1.79	3.42	4.43	5.02	5.37	5.65	5.92	6.17	**6.36**	**6.53**	**6.65**	**6.75**	**6.81**	**6.86**	**6.89**	**6.91**	**6.92**	**6.94**	**6.94**	**6.95**	**6.95**	**6.96**	**6.96**	**6.96**	**6.96**	**6.96**	**6.96**	**6.96**
2001	0.06	0.70	2.06	3.25	4.01	4.61	4.97	5.31	5.66	**5.99**	**6.26**	**6.46**	**6.62**	**6.73**	**6.80**	**6.85**	**6.88**	**6.91**	**6.92**	**6.94**	**6.94**	**6.95**	**6.95**	**6.96**	**6.96**	**6.96**	**6.96**	**6.96**	**6.96**	**6.96**
2002	0.01	0.32	1.49	2.52	3.37	4.08	4.83	5.48	**6.05**	**6.58**	**6.95**	**7.23**	**7.41**	**7.52**	**7.59**	**7.64**	**7.67**	**7.70**	**7.72**	**7.73**	**7.73**	**7.74**	**7.74**	**7.74**	**7.74**	**7.75**	**7.75**	**7.75**	**7.75**	**7.75**
2003	0.03	0.62	1.72	2.85	3.98	5.06	5.98	**6.78**	**7.59**	**8.17**	**8.63**	**8.93**	**9.10**	**9.21**	**9.28**	**9.33**	**9.37**	**9.40**	**9.41**	**9.42**	**9.43**	**9.44**	**9.44**	**9.44**	**9.44**	**9.44**	**9.44**	**9.44**	**9.44**	**9.44**
2004	0.06	0.61	1.80	3.32	5.01	6.45	**7.74**	**9.28**	**10.35**	**11.17**	**11.71**	**12.05**	**12.26**	**12.39**	**12.48**	**12.54**	**12.59**	**12.61**	**12.63**	**12.64**	**12.65**	**12.66**	**12.66**	**12.66**	**12.66**	**12.67**	**12.67**	**12.67**	**12.67**	**12.67**
2005	0.05	0.83	2.82	5.75	8.50	**11.34**	**14.83**	**17.25**	**19.11**	**20.30**	**21.08**	**21.58**	**21.88**	**22.09**	**22.24**	**22.33**	**22.40**	**22.44**	**22.46**	**22.48**	**22.49**	**22.50**	**22.50**	**22.51**	**22.51**	**22.51**	**22.51**	**22.51**	**22.51**	**22.51**
2006	0.03	1.25	4.20	8.58	**13.55**	**18.90**	**22.72**	**25.74**	**27.69**	**28.99**	**29.84**	**30.39**	**30.75**	**31.02**	**31.19**	**31.30**	**31.37**	**31.41**	**31.44**	**31.46**	**31.47**	**31.48**	**31.49**	**31.49**	**31.49**	**31.49**	**31.50**	**31.50**	**31.50**	**31.50**
2007	0.02	1.27	5.61	**12.62**	**19.41**	**24.38**	**28.27**	**30.72**	**32.33**	**33.43**	**34.14**	**34.63**	**34.98**	**35.21**	**35.36**	**35.45**	**35.51**	**35.54**	**35.57**	**35.58**	**35.59**	**35.60**	**35.60**	**35.60**	**35.61**	**35.61**	**35.61**	**35.61**	**35.61**	**35.61**
2008	0.01	0.74	**4.50**	**11.12**	**16.27**	**20.46**	**23.13**	**24.90**	**26.11**	**26.89**	**27.42**	**27.79**	**28.02**	**28.15**	**28.24**	**28.29**	**28.32**	**28.34**	**28.35**	**28.36**	**28.36**	**28.36**	**28.37**	**28.37**	**28.37**	**28.37**	**28.37**	**28.37**	**28.37**	**28.37**
2009	0.11	**1.10**	**4.58**	**8.46**	**12.02**	**14.47**	**16.15**	**17.26**	**17.99**	**18.47**	**18.81**	**19.01**	**19.14**	**19.21**	**19.25**	**19.27**	**19.28**	**19.29**	**19.29**	**19.30**	**19.30**	**19.30**	**19.30**	**19.30**	**19.30**	**19.30**	**19.30**	**19.30**	**19.30**	**19.30**
2010	**0.03**	**1.05**	**3.62**	**6.89**	**9.51**	**11.37**	**12.60**	**13.40**	**13.92**	**14.28**	**14.51**	**14.64**	**14.72**	**14.75**	**14.78**	**14.79**	**14.80**	**14.80**	**14.80**	**14.80**	**14.81**	**14.81**	**14.81**	**14.81**	**14.81**	**14.81**	**14.81**	**14.81**	**14.81**	**14.81**
2011	**0.07**	**0.88**	**2.86**	**5.31**	**7.19**	**8.40**	**9.12**	**9.54**	**9.81**	**9.96**	**10.01**	**10.04**	**10.05**	**10.06**	**10.06**	**10.07**	**10.07**	**10.07**	**10.07**	**10.07**	**10.07**	**10.07**	**10.07**	**10.07**	**10.07**	**10.07**	**10.07**	**10.07**	**10.07**	**10.07**
2012	**0.08**	**1.07**	**3.14**	**5.14**	**6.51**	**7.36**	**7.86**	**8.18**	**8.36**	**8.44**	**8.47**	**8.49**	**8.50**	**8.51**	**8.51**	**8.51**	**8.52**	**8.52**	**8.52**	**8.52**	**8.52**	**8.52**	**8.52**	**8.52**	**8.52**	**8.52**	**8.52**	**8.52**	**8.52**	**8.52**
2013	**0.09**	**1.09**	**3.21**	**5.25**	**6.68**	**7.57**	**8.12**	**8.43**	**8.55**	**8.61**	**8.64**	**8.66**	**8.67**	**8.67**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**
2014	**0.08**	**0.96**	**2.98**	**5.07**	**6.60**	**7.60**	**8.18**	**8.41**	**8.53**	**8.59**	**8.63**	**8.65**	**8.66**	**8.67**	**8.67**	**8.67**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**	**8.68**
2015	**0.08**	**0.98**	**3.06**	**5.23**	**6.83**	**7.77**	**8.16**	**8.35**	**8.47**	**8.53**	**8.56**	**8.58**	**8.59**	**8.60**	**8.60**	**8.60**	**8.60**	**8.60**	**8.60**	**8.60**	**8.61**	**8.61**	**8.61**	**8.61**	**8.61**	**8.61**	**8.61**	**8.61**	**8.61**	**8.61**
2016	**0.08**	**1.07**	**3.41**	**5.89**	**7.56**	**8.32**	**8.70**	**8.93**	**9.06**	**9.13**	**9.17**	**9.19**	**9.20**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**
2017	**0.10**	**1.16**	**3.48**	**5.61**	**6.73**	**7.29**	**7.63**	**7.82**	**7.92**	**7.97**	**8.00**	**8.01**	**8.02**	**8.03**	**8.03**	**8.03**	**8.03**	**8.03**	**8.03**	**8.03**	**8.03**	**8.03**	**8.03**	**8.03**	**8.03**	**8.03**	**8.03**	**8.03**	**8.03**	**8.03**

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
1990	0.47	3.08	8.87	19.22	28.78	34.71	43.01	48.61	56.49	62.40	66.19	70.68	74.83	78.10	80.33	81.66	83.18	83.96	84.56	85.10	**85.32**	**85.59**	**85.84**	**86.29**	**86.90**	**87.55**	**87.99**	**88.36**	**88.79**	**89.21**
1991	0.38	2.88	9.79	18.54	24.64	33.34	40.89	50.24	58.50	62.99	69.22	74.48	78.81	81.52	83.18	85.08	86.12	86.66	87.10	**87.30**	**87.53**	**87.74**	**88.12**	**88.60**	**89.11**	**89.47**	**89.77**	**90.11**	**90.45**	**90.75**
1992	0.38	3.90	10.81	17.33	28.04	36.50	48.18	57.42	62.17	68.56	74.08	78.80	81.64	83.38	84.85	85.89	86.55	86.87	**87.13**	**87.38**	**87.61**	**87.99**	**88.46**	**88.96**	**89.34**	**89.66**	**90.02**	**90.36**	**90.67**	**90.95**
1993	0.89	5.37	11.19	22.88	31.61	44.45	54.77	59.81	67.55	73.94	79.13	82.23	84.13	85.50	86.58	87.19	87.48	**87.72**	**87.94**	**88.15**	**88.50**	**88.92**	**89.38**	**89.72**	**90.00**	**90.32**	**90.62**	**90.88**	**91.12**	**91.30**
1994	0.58	3.46	13.33	23.10	38.67	50.28	56.02	65.21	72.45	78.38	81.87	84.00	85.52	86.59	87.18	87.45	**87.66**	**87.89**	**88.10**	**88.45**	**88.88**	**89.33**	**89.67**	**89.95**	**90.26**	**90.55**	**90.81**	**91.03**	**91.20**	**91.34**
1995	2.02	12.56	25.28	45.13	56.09	61.05	68.71	74.59	79.28	82.30	84.27	85.66	86.57	87.03	87.22	**87.37**	**87.56**	**87.74**	**88.02**	**88.37**	**88.74**	**89.00**	**89.21**	**89.46**	**89.68**	**89.88**	**90.05**	**90.18**	**90.28**	**90.36**
1996	1.08	7.93	37.73	56.07	62.16	71.32	76.99	81.13	83.90	85.69	86.93	87.81	88.24	88.42	**88.56**	**88.76**	**88.95**	**89.24**	**89.58**	**89.93**	**90.16**	**90.35**	**90.55**	**90.72**	**90.87**	**90.98**	**91.06**	**91.12**	**91.17**	**91.20**
1997	1.85	23.97	48.60	57.01	69.69	76.02	80.61	83.65	85.64	87.15	88.19	88.72	88.92	**89.09**	**89.34**	**89.56**	**89.92**	**90.32**	**90.72**	**90.99**	**91.21**	**91.44**	**91.63**	**91.79**	**91.91**	**92.00**	**92.07**	**92.12**	**92.15**	**92.17**
1998	5.92	29.17	41.61	62.48	71.92	78.06	82.04	84.70	86.55	87.82	88.45	88.72	**88.90**	**89.17**	**89.42**	**89.80**	**90.22**	**90.64**	**90.95**	**91.18**	**91.43**	**91.63**	**91.80**	**91.94**	**92.03**	**92.10**	**92.15**	**92.18**	**92.21**	**92.22**
1999	2.13	7.03	35.22	53.87	66.39	73.67	79.17	83.18	85.99	87.34	87.80	**88.12**	**88.55**	**88.94**	**89.56**	**90.26**	**90.95**	**91.39**	**91.72**	**92.06**	**92.34**	**92.56**	**92.74**	**92.85**	**92.94**	**92.99**	**93.04**	**93.06**	**93.08**	**93.10**
2000	1.34	32.35	51.92	64.66	72.10	78.17	82.40	85.50	86.94	87.39	**87.74**	**88.18**	**88.60**	**89.25**	**89.95**	**90.63**	**91.11**	**91.48**	**91.84**	**92.15**	**92.39**	**92.57**	**92.69**	**92.78**	**92.84**	**92.89**	**92.92**	**92.94**	**92.96**	**92.97**
2001	12.11	31.56	50.28	61.47	71.14	78.17	83.06	85.04	85.75	**86.15**	**86.70**	**87.21**	**88.06**	**89.05**	**90.03**	**90.65**	**91.12**	**91.59**	**91.97**	**92.27**	**92.49**	**92.64**	**92.75**	**92.82**	**92.87**	**92.90**	**92.93**	**92.95**	**92.96**	**92.98**
2002	3.71	29.03	44.90	60.57	71.78	79.69	82.82	83.71	**84.30**	**84.91**	**85.47**	**86.42**	**87.54**	**88.70**	**89.46**	**90.04**	**90.60**	**91.05**	**91.40**	**91.65**	**91.82**	**91.94**	**92.02**	**92.08**	**92.11**	**92.14**	**92.16**	**92.17**	**92.19**	**92.20**
2003	9.07	25.79	48.06	64.56	75.15	79.08	80.20	**80.87**	**81.60**	**82.27**	**83.37**	**84.66**	**86.02**	**87.00**	**87.74**	**88.47**	**89.04**	**89.48**	**89.81**	**90.02**	**90.17**	**90.27**	**90.34**	**90.38**	**90.41**	**90.44**	**90.46**	**90.48**	**90.49**	**90.50**
2004	4.28	28.01	50.74	66.59	72.43	74.05	**74.96**	**75.87**	**76.69**	**78.09**	**79.77**	**81.50**	**82.72**	**83.68**	**84.62**	**85.36**	**85.94**	**86.36**	**86.64**	**86.82**	**86.95**	**87.05**	**87.10**	**87.15**	**87.18**	**87.21**	**87.23**	**87.24**	**87.26**	**87.27**
2005	5.52	22.46	39.89	50.72	53.72	**55.26**	**56.61**	**57.81**	**59.93**	**62.71**	**65.68**	**67.80**	**69.58**	**71.44**	**72.99**	**74.22**	**75.15**	**75.78**	**76.21**	**76.52**	**76.75**	**76.89**	**76.99**	**77.08**	**77.14**	**77.20**	**77.24**	**77.27**	**77.30**	**77.33**
2006	2.84	14.82	29.18	38.17	**40.77**	**42.38**	**43.79**	**46.21**	**49.29**	**52.74**	**55.37**	**57.60**	**60.01**	**62.09**	**63.79**	**65.10**	**66.00**	**66.63**	**67.09**	**67.42**	**67.63**	**67.78**	**67.90**	**68.00**	**68.08**	**68.14**	**68.20**	**68.24**	**68.27**	**68.30**
2007	1.78	12.77	28.25	**35.46**	**37.32**	**38.86**	**41.48**	**44.77**	**48.47**	**51.21**	**53.49**	**55.91**	**58.00**	**59.71**	**61.03**	**61.93**	**62.56**	**63.02**	**63.35**	**63.56**	**63.71**	**63.83**	**63.93**	**64.00**	**64.06**	**64.11**	**64.16**	**64.19**	**64.22**	**64.24**
2008	0.81	23.53	**34.48**	**37.62**	**39.84**	**43.43**	**47.97**	**53.05**	**56.51**	**59.37**	**62.33**	**64.89**	**66.96**	**68.46**	**69.45**	**70.10**	**70.55**	**70.86**	**71.04**	**71.17**	**71.27**	**71.34**	**71.39**	**71.44**	**71.47**	**71.50**	**71.52**	**71.54**	**71.55**	**71.56**
2009	13.13	**25.23**	**30.31**	**34.57**	**40.94**	**48.63**	**56.58**	**61.77**	**65.84**	**69.98**	**73.35**	**75.87**	**77.61**	**78.70**	**79.40**	**79.84**	**80.12**	**80.27**	**80.38**	**80.45**	**80.51**	**80.55**	**80.58**	**80.60**	**80.62**	**80.64**	**80.65**	**80.65**	**80.66**	**80.67**
2010	**1.79**	**9.09**	**16.46**	**28.66**	**42.01**	**53.60**	**61.28**	**67.08**	**72.81**	**77.12**	**80.15**	**82.15**	**83.32**	**84.03**	**84.45**	**84.71**	**84.85**	**84.94**	**85.00**	**85.05**	**85.08**	**85.10**	**85.12**	**85.14**	**85.15**	**85.16**	**85.16**	**85.17**	**85.17**	**85.18**
2011	**3.80**	**12.62**	**32.85**	**55.33**	**67.51**	**75.13**	**80.06**	**83.40**	**85.68**	**87.39**	**88.60**	**89.19**	**89.51**	**89.68**	**89.77**	**89.82**	**89.85**	**89.88**	**89.89**	**89.90**	**89.91**	**89.91**	**89.92**	**89.92**	**89.92**	**89.92**	**89.92**	**89.92**	**89.93**	**89.93**
2012	**6.33**	**30.95**	**56.61**	**70.56**	**77.86**	**82.38**	**85.41**	**87.47**	**89.02**	**90.14**	**90.70**	**91.01**	**91.19**	**91.30**	**91.36**	**91.40**	**91.42**	**91.44**	**91.45**	**91.46**	**91.46**	**91.47**	**91.47**	**91.47**	**91.47**	**91.48**	**91.48**	**91.48**	**91.48**	**91.48**
2013	**9.83**	**39.52**	**61.67**	**73.61**	**79.67**	**83.58**	**86.24**	**88.28**	**89.66**	**90.35**	**90.73**	**90.96**	**91.10**	**91.17**	**91.22**	**91.25**	**91.27**	**91.28**	**91.29**	**91.30**	**91.30**	**91.31**	**91.31**	**91.31**	**91.31**	**91.31**	**91.31**	**91.32**	**91.32**	**91.32**
2014	**9.96**	**38.21**	**60.26**	**72.26**	**78.70**	**82.99**	**86.22**	**88.48**	**89.66**	**90.30**	**90.67**	**90.91**	**91.04**	**91.12**	**91.18**	**91.22**	**91.25**	**91.27**	**91.28**	**91.29**	**91.29**	**91.30**	**91.30**	**91.31**	**91.31**	**91.31**	**91.31**	**91.31**	**91.31**	**91.32**
2015	**8.97**	**36.86**	**59.24**	**71.98**	**78.99**	**84.11**	**87.54**	**89.22**	**90.09**	**90.58**	**90.88**	**91.05**	**91.16**	**91.23**	**91.28**	**91.31**	**91.34**	**91.35**	**91.36**	**91.37**	**91.37**	**91.38**	**91.38**	**91.38**	**91.38**	**91.39**	**91.39**	**91.39**	**91.39**	**91.39**
2016	**8.08**	**34.93**	**57.77**	**71.23**	**79.33**	**84.69**	**87.32**	**88.71**	**89.49**	**89.95**	**90.21**	**90.39**	**90.52**	**90.60**	**90.65**	**90.69**	**90.72**	**90.73**	**90.75**	**90.75**	**90.76**	**90.77**	**90.77**	**90.77**	**90.77**	**90.78**	**90.78**	**90.78**	**90.78**	**90.78**
2017	**8.65**	**37.77**	**61.30**	**75.80**	**83.83**	**87.41**	**89.28**	**90.32**	**90.94**	**91.28**	**91.50**	**91.65**	**91.75**	**91.82**	**91.86**	**91.89**	**91.91**	**91.92**	**91.93**	**91.94**	**91.94**	**91.95**	**91.95**	**91.95**	**91.96**	**91.96**	**91.96**	**91.96**	**91.96**	**91.96**

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
1993	0.02	0.27	0.84	1.42	2.09	1.64	1.35	1.19	0.54	0.44	0.30	0.12	0.08	0.00	0.43	0.00	0.28	**0.04**	**0.18**	**0.16**	**0.11**	**0.08**	**0.06**	**0.04**	**0.03**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**
1994	0.02	0.53	1.85	3.07	2.88	2.45	1.59	0.82	0.60	0.30	0.30	0.11	0.10	0.00	0.10	0.16	**0.54**	**0.20**	**0.18**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**
1995	0.15	1.34	3.14	2.75	2.87	2.75	0.94	0.56	0.85	0.16	0.20	0.24	0.56	0.33	0.37	**0.55**	**0.50**	**0.40**	**0.26**	**0.17**	**0.12**	**0.08**	**0.06**	**0.04**	**0.03**	**0.03**	**0.02**	**0.02**	**0.01**	**0.01**
1996	0.01	0.50	2.17	3.69	2.88	1.35	1.66	0.76	1.09	0.84	0.88	0.28	0.68	0.39	**2.24**	**0.61**	**0.58**	**0.44**	**0.37**	**0.31**	**0.27**	**0.22**	**0.19**	**0.16**	**0.13**	**0.11**	**0.09**	**0.07**	**0.04**	**0.03**
1997	0.04	0.74	2.62	3.79	2.50	1.86	1.79	0.98	1.18	0.90	0.88	0.74	1.25	**2.36**	**0.68**	**0.63**	**0.45**	**0.37**	**0.30**	**0.24**	**0.19**	**0.15**	**0.12**	**0.09**	**0.07**	**0.06**	**0.05**	**0.04**	**0.03**	**0.03**
1998	0.06	0.54	1.62	1.64	1.88	1.88	1.85	1.20	0.58	0.31	1.21	0.24	**1.49**	**0.92**	**0.83**	**0.60**	**0.49**	**0.40**	**0.33**	**0.26**	**0.21**	**0.17**	**0.13**	**0.10**	**0.08**	**0.07**	**0.05**	**0.04**	**0.04**	**0.03**
1999	0.00	0.21	0.55	1.11	2.50	1.63	1.39	0.63	1.14	0.67	1.22	**0.77**	**1.40**	**1.23**	**0.90**	**0.73**	**0.58**	**0.47**	**0.38**	**0.31**	**0.25**	**0.20**	**0.15**	**0.13**	**0.11**	**0.09**	**0.07**	**0.06**	**0.05**	**0.04**
2000	0.02	0.43	1.72	4.07	2.83	2.80	1.73	1.65	1.69	0.73	**3.71**	**1.67**	**1.55**	**1.17**	**0.97**	**0.77**	**0.61**	**0.49**	**0.40**	**0.32**	**0.25**	**0.19**	**0.16**	**0.13**	**0.10**	**0.08**	**0.07**	**0.06**	**0.05**	**0.04**
2001	0.00	0.28	2.76	3.46	2.94	2.74	1.86	4.23	4.79	**4.18**	**2.47**	**2.09**	**1.42**	**1.10**	**0.82**	**0.65**	**0.52**	**0.43**	**0.35**	**0.28**	**0.22**	**0.18**	**0.15**	**0.12**	**0.10**	**0.09**	**0.08**	**0.06**	**0.05**	**0.04**
2002	0.01	0.46	1.69	1.98	2.36	2.94	4.47	4.85	**5.34**	**3.97**	**3.32**	**2.22**	**1.61**	**1.16**	**0.92**	**0.73**	**0.59**	**0.48**	**0.39**	**0.30**	**0.25**	**0.20**	**0.16**	**0.13**	**0.12**	**0.10**	**0.08**	**0.06**	**0.05**	**0.04**
2003	0.03	0.78	1.94	2.49	2.90	4.91	4.78	**5.57**	**4.93**	**4.15**	**2.89**	**2.14**	**1.51**	**1.15**	**0.90**	**0.72**	**0.58**	**0.47**	**0.36**	**0.30**	**0.25**	**0.20**	**0.16**	**0.15**	**0.12**	**0.10**	**0.08**	**0.06**	**0.05**	**0.04**
2004	0.07	1.01	2.53	3.51	5.50	6.36	**5.95**	**6.85**	**5.93**	**4.30**	**3.33**	**2.42**	**1.74**	**1.31**	**1.04**	**0.84**	**0.68**	**0.53**	**0.45**	**0.37**	**0.30**	**0.25**	**0.23**	**0.19**	**0.15**	**0.12**	**0.10**	**0.08**	**0.06**	**0.05**
2005	0.14	1.74	3.58	4.88	6.28	**5.88**	**8.11**	**7.33**	**5.53**	**4.37**	**3.23**	**2.26**	**1.59**	**1.22**	**0.97**	**0.77**	**0.59**	**0.49**	**0.40**	**0.32**	**0.25**	**0.22**	**0.19**	**0.15**	**0.12**	**0.09**	**0.07**	**0.06**	**0.05**	**0.04**
2006	0.23	2.50	4.97	7.20	**10.11**	**10.45**	**10.08**	**7.72**	**6.14**	**4.56**	**3.55**	**2.44**	**1.83**	**1.46**	**1.17**	**0.92**	**0.75**	**0.61**	**0.47**	**0.39**	**0.36**	**0.30**	**0.24**	**0.20**	**0.16**	**0.13**	**0.10**	**0.08**	**0.07**	**0.05**
2007	0.00	2.14	4.26	**16.18**	**15.69**	**14.97**	**11.80**	**9.33**	**6.63**	**4.98**	**3.22**	**2.53**	**1.72**	**1.39**	**0.98**	**0.82**	**0.69**	**0.56**	**0.46**	**0.39**	**0.33**	**0.26**	**0.21**	**0.17**	**0.14**	**0.11**	**0.09**	**0.07**	**0.06**	**0.05**
2008	0.00	1.10	**7.22**	**18.61**	**19.47**	**16.97**	**14.48**	**11.06**	**8.37**	**6.09**	**4.35**	**3.05**	**2.12**	**1.53**	**1.19**	**0.96**	**0.73**	**0.56**	**0.48**	**0.37**	**0.28**	**0.22**	**0.17**	**0.13**	**0.10**	**0.07**	**0.06**	**0.05**	**0.04**	**0.03**
2009	0.02	**1.03**	**9.34**	**13.56**	**14.30**	**13.83**	**12.08**	**10.06**	**8.08**	**6.36**	**5.04**	**3.95**	**2.97**	**2.37**	**1.83**	**1.42**	**1.05**	**0.87**	**0.65**	**0.45**	**0.33**	**0.23**	**0.17**	**0.13**	**0.10**	**0.08**	**0.06**	**0.05**	**0.04**	**0.03**
2010	**0.18**	**4.65**	**9.37**	**11.75**	**12.24**	**11.41**	**9.72**	**7.88**	**6.26**	**4.94**	**3.88**	**2.92**	**2.33**	**1.82**	**1.37**	**1.00**	**0.81**	**0.61**	**0.45**	**0.34**	**0.25**	**0.19**	**0.15**	**0.12**	**0.09**	**0.07**	**0.06**	**0.04**	**0.04**	**0.03**
2011	**0.96**	**4.49**	**8.99**	**11.48**	**11.48**	**10.01**	**8.11**	**6.42**	**5.02**	**3.83**	**2.61**	**2.31**	**1.79**	**1.38**	**1.04**	**0.87**	**0.70**	**0.55**	**0.42**	**0.33**	**0.26**	**0.20**	**0.20**	**0.16**	**0.12**	**0.10**	**0.08**	**0.06**	**0.04**	**0.03**
2012	**0.82**	**4.29**	**8.06**	**9.69**	**9.30**	**7.99**	**6.56**	**5.27**	**4.09**	**2.92**	**2.62**	**2.06**	**1.58**	**1.19**	**1.01**	**0.80**	**0.62**	**0.48**	**0.38**	**0.30**	**0.23**	**0.23**	**0.19**	**0.15**	**0.12**	**0.09**	**0.07**	**0.05**	**0.04**	**0.03**
2013	**0.68**	**2.82**	**5.76**	**7.38**	**7.40**	**6.60**	**5.59**	**4.49**	**3.34**	**3.03**	**2.41**	**1.94**	**1.54**	**1.32**	**1.07**	**0.82**	**0.65**	**0.51**	**0.40**	**0.31**	**0.30**	**0.23**	**0.18**	**0.14**	**0.11**	**0.08**	**0.06**	**0.05**	**0.04**	**0.03**
2014	**0.51**	**2.24**	**4.84**	**6.38**	**6.48**	**5.84**	**4.92**	**3.71**	**3.48**	**2.86**	**2.27**	**1.75**	**1.47**	**1.17**	**0.91**	**0.72**	**0.58**	**0.46**	**0.37**	**0.37**	**0.29**	**0.23**	**0.18**	**0.14**	**0.11**	**0.07**	**0.06**	**0.04**	**0.04**	**0.03**
2015	**0.42**	**1.98**	**4.48**	**6.03**	**6.29**	**5.63**	**4.43**	**4.23**	**3.57**	**2.93**	**2.31**	**1.93**	**1.54**	**1.22**	**0.97**	**0.77**	**0.63**	**0.50**	**0.51**	**0.41**	**0.33**	**0.27**	**0.22**	**0.17**	**0.12**	**0.10**	**0.08**	**0.06**	**0.05**	**0.04**
2016	**0.44**	**2.00**	**4.43**	**6.06**	**6.27**	**5.26**	**5.15**	**4.37**	**3.58**	**2.83**	**2.43**	**1.91**	**1.48**	**1.17**	**0.93**	**0.74**	**0.60**	**0.61**	**0.49**	**0.39**	**0.31**	**0.25**	**0.20**	**0.14**	**0.11**	**0.09**	**0.07**	**0.06**	**0.05**	**0.04**
2017	**0.42**	**1.89**	**4.28**	**5.80**	**5.71**	**6.19**	**5.50**	**4.55**	**3.72**	**3.25**	**2.55**	**1.90**	**1.45**	**1.16**	**0.93**	**0.76**	**0.78**	**0.63**	**0.50**	**0.40**	**0.32**	**0.25**	**0.17**	**0.13**	**0.11**	**0.08**	**0.07**	**0.05**	**0.04**	**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
1993	2.90	10.10	9.19	13.09	11.56	18.40	18.63	14.53	23.62	25.85	29.78	20.73	15.73	16.14	12.97	10.74	8.11	**4.08**	**7.04**	**7.47**	**16.34**	**22.20**	**25.46**	**22.34**	**22.19**	**26.37**	**27.21**	**27.87**	**28.43**	**27.91**
1994	3.66	7.06	11.36	10.34	15.98	16.81	12.62	20.83	23.14	28.26	22.27	18.97	17.08	14.77	10.71	9.90	**4.82**	**7.61**	**7.86**	**16.95**	**22.93**	**26.55**	**23.95**	**23.54**	**27.54**	**28.26**	**28.86**	**29.33**	**28.63**	**28.04**
1995	4.48	17.46	13.72	20.14	15.91	12.45	21.44	22.98	23.27	19.81	15.77	14.73	15.64	10.67	5.99	**6.70**	**7.25**	**7.76**	**17.02**	**23.27**	**25.61**	**22.84**	**22.80**	**26.89**	**27.71**	**28.41**	**29.01**	**28.52**	**28.05**	**27.59**
1996	4.56	21.33	39.78	32.69	15.84	27.30	27.91	29.89	27.00	22.56	21.98	15.95	12.93	7.87	**6.55**	**12.30**	**12.93**	**26.86**	**34.81**	**37.66**	**34.65**	**34.07**	**38.33**	**39.02**	**39.69**	**40.28**	**39.55**	**39.07**	**39.29**	**38.92**
1997	8.95	42.89	36.04	17.39	30.34	26.80	31.70	26.23	23.91	22.47	20.23	10.04	4.58	**5.25**	**12.27**	**13.27**	**27.78**	**35.69**	**39.14**	**35.79**	**34.96**	**39.28**	**39.70**	**40.06**	**40.36**	**39.38**	**38.50**	**37.70**	**36.98**	**34.32**
1998	15.70	42.75	22.52	40.85	33.59	35.32	29.97	29.42	24.77	23.30	14.55	6.95	**4.24**	**12.77**	**13.30**	**27.24**	**35.13**	**38.63**	**35.63**	**34.61**	**38.61**	**39.06**	**39.49**	**39.90**	**39.06**	**38.33**	**37.67**	**37.08**	**34.51**	**33.45**
1999	5.90	11.86	33.27	30.58	32.87	28.62	28.79	27.76	23.74	16.97	9.59	**7.68**	**12.18**	**13.38**	**28.03**	**35.90**	**39.05**	**35.22**	**34.66**	**39.11**	**39.49**	**39.81**	**40.08**	**39.06**	**38.15**	**37.33**	**36.58**	**33.91**	**32.75**	**32.24**
2000	3.44	22.98	21.81	19.97	21.29	22.81	27.14	26.68	13.54	3.63	**5.17**	**9.29**	**10.02**	**21.70**	**27.47**	**31.98**	**29.38**	**29.08**	**33.58**	**34.43**	**35.23**	**35.97**	**35.45**	**34.96**	**34.50**	**34.05**	**31.70**	**30.72**	**30.34**	**29.96**
2001	5.23	30.52	27.26	24.78	28.71	28.27	25.99	15.26	5.25	**4.38**	**9.60**	**10.83**	**24.24**	**31.44**	**35.41**	**32.02**	**31.62**	**36.13**	**36.67**	**37.16**	**37.62**	**36.84**	**36.16**	**35.55**	**35.01**	**32.10**	**31.62**	**31.24**	**30.89**	**30.55**
2002	8.23	32.86	26.37	30.58	30.62	31.31	18.89	7.15	**4.76**	**9.22**	**10.46**	**23.88**	**32.27**	**36.65**	**34.18**	**33.87**	**38.50**	**39.21**	**39.83**	**40.35**	**39.49**	**38.67**	**37.89**	**37.13**	**34.39**	**33.13**	**32.51**	**31.90**	**31.31**	**30.72**
2003	13.84	25.73	32.44	33.57	32.44	20.33	7.19	**5.76**	**9.14**	**10.08**	**22.66**	**30.70**	**36.28**	**34.69**	**34.28**	**38.57**	**39.41**	**39.94**	**40.46**	**39.53**	**38.65**	**37.83**	**37.05**	**34.31**	**33.06**	**32.44**	**31.86**	**31.29**	**30.75**	**30.23**
2004	8.04	27.73	29.75	29.32	18.64	6.48	**5.04**	**8.06**	**9.10**	**20.98**	**28.88**	**34.15**	**32.44**	**32.87**	**37.78**	**38.53**	**39.20**	**39.71**	**38.92**	**38.25**	**37.62**	**37.02**	**34.46**	**33.37**	**32.92**	**32.47**	**32.02**	**31.57**	**31.12**	**29.68**
2005	11.37	22.63	22.16	17.41	5.06	**3.91**	**6.75**	**7.44**	**17.29**	**24.80**	**29.07**	**28.37**	**29.71**	**34.87**	**35.92**	**36.72**	**37.33**	**36.65**	**36.21**	**35.90**	**35.52**	**33.21**	**32.21**	**31.79**	**31.37**	**30.93**	**30.49**	**30.05**	**29.63**	**28.05**
2006	7.40	16.90	17.39	9.80	**4.72**	**5.93**	**6.31**	**15.02**	**21.83**	**28.07**	**26.57**	**28.39**	**33.67**	**34.64**	**35.11**	**35.35**	**34.91**	**34.65**	**34.66**	**33.77**	**31.09**	**29.89**	**29.33**	**28.82**	**28.36**	**27.96**	**27.61**	**27.29**	**27.02**	**26.77**
2007	7.14	17.52	20.74	**10.16**	**4.22**	**4.60**	**11.72**	**17.59**	**22.03**	**22.06**	**24.79**	**29.19**	**31.76**	**32.31**	**33.73**	**33.05**	**32.53**	**32.18**	**32.00**	**30.27**	**29.61**	**29.51**	**29.39**	**29.27**	**29.15**	**29.04**	**28.93**	**28.82**	**28.71**	**28.61**
2008	3.26	27.45	**7.99**	**3.54**	**3.64**	**8.74**	**13.06**	**16.60**	**16.73**	**18.81**	**24.19**	**27.55**	**30.73**	**32.46**	**32.89**	**33.00**	**33.90**	**34.20**	**32.47**	**32.16**	**32.17**	**31.96**	**31.77**	**31.92**	**31.75**	**31.44**	**31.14**	**30.84**	**30.55**	**30.26**
2009	3.14	**7.29**	**6.10**	**5.51**	**11.97**	**16.80**	**20.65**	**19.53**	**21.14**	**26.28**	**28.80**	**30.74**	**32.63**	**33.34**	**34.39**	**35.22**	**36.15**	**34.79**	**35.25**	**35.91**	**36.20**	**36.32**	**35.72**	**35.02**	**34.27**	**33.49**	**32.71**	**31.95**	**31.20**	**30.49**
2010	**2.49**	**7.34**	**6.34**	**14.23**	**20.71**	**22.54**	**22.08**	**23.58**	**28.42**	**31.03**	**32.91**	**34.91**	**35.74**	**36.63**	**37.81**	**39.09**	**37.93**	**37.80**	**37.90**	**37.73**	**37.42**	**36.91**	**36.26**	**35.56**	**34.83**	**34.10**	**33.37**	**32.66**	**31.98**	**30.57**
2011	**5.68**	**8.04**	**18.48**	**27.17**	**26.00**	**26.76**	**28.19**	**29.76**	**32.23**	**35.33**	**36.82**	**33.86**	**34.93**	**35.90**	**36.86**	**35.40**	**34.98**	**34.81**	**34.63**	**34.29**	**33.95**	**33.43**	**27.79**	**27.18**	**26.85**	**26.37**	**25.87**	**27.60**	**31.88**	**31.12**
2012	**7.57**	**26.32**	**31.27**	**30.28**	**28.97**	**29.40**	**30.78**	**33.25**	**36.19**	**36.91**	**33.69**	**34.48**	**35.27**	**36.11**	**34.59**	**34.17**	**34.20**	**34.18**	**33.88**	**33.51**	**33.09**	**27.64**	**26.87**	**26.52**	**26.16**	**25.78**	**27.76**	**32.11**	**31.52**	**30.95**
2013	**20.99**	**36.90**	**35.29**	**33.65**	**31.68**	**32.07**	**34.17**	**36.79**	**36.98**	**33.57**	**34.13**	**34.34**	**34.84**	**33.38**	**32.94**	**33.02**	**32.90**	**32.76**	**32.47**	**32.29**	**27.06**	**26.47**	**26.18**	**25.96**	**25.64**	**27.53**	**31.98**	**31.43**	**30.88**	**30.36**
2014	**24.78**	**38.84**	**36.79**	**34.99**	**33.47**	**34.94**	**37.25**	**37.33**	**33.38**	**33.62**	**33.99**	**34.71**	**33.46**	**33.41**	**33.46**	**33.25**	**32.92**	**32.59**	**32.21**	**26.81**	**26.20**	**25.90**	**25.73**	**25.44**	**27.29**	**31.78**	**31.23**	**30.70**	**30.18**	**29.69**
2015	**25.61**	**39.48**	**37.35**	**36.16**	**35.75**	**37.65**	**38.06**	**33.79**	**33.73**	**33.94**	**34.52**	**33.43**	**33.23**	**33.12**	**32.84**	**32.47**	**31.95**	**31.41**	**25.88**	**25.18**	**24.70**	**24.18**	**23.65**	**24.98**	**28.98**	**28.11**	**27.29**	**26.52**	**25.81**	**25.16**
2016	**25.34**	**39.73**	**38.21**	**37.74**	**37.22**	**37.50**	**33.03**	**32.87**	**33.17**	**33.89**	**32.60**	**32.76**	**32.93**	**32.71**	**32.40**	**31.94**	**31.37**	**25.95**	**25.19**	**24.74**	**24.26**	**23.76**	**25.27**	**29.20**	**28.41**	**27.64**	**26.92**	**26.25**	**25.63**	**25.07**
2017	**26.01**	**40.76**	**40.34**	**40.13**	**38.55**	**32.28**	**32.11**	**32.63**	**33.13**	**32.15**	**32.87**	**33.99**	**34.54**	**34.57**	**34.50**	**34.29**	**28.77**	**28.37**	**28.22**	**28.06**	**27.84**	**29.88**	**34.91**	**34.72**	**34.31**	**33.90**	**33.48**	**33.07**	**32.67**	**32.28**

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
1993	0.02	0.29	1.02	2.13	3.53	4.47	5.10	5.54	5.71	5.81	5.87	5.88	5.89	5.89	5.92	5.92	5.93	**5.93**	**5.94**	**5.95**	**5.95**	**5.96**	**5.96**	**5.96**	**5.96**	**5.96**	**5.96**	**5.96**	**5.96**	**5.96**
1994	0.02	0.53	2.18	4.55	6.48	7.81	8.51	8.81	8.99	9.06	9.11	9.12	9.13	9.13	9.14	9.15	**9.18**	**9.19**	**9.20**	**9.20**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**	**9.21**
1995	0.15	1.43	3.86	5.63	7.06	8.17	8.49	8.63	8.81	8.83	8.86	8.88	8.93	8.95	8.98	**9.01**	**9.04**	**9.06**	**9.08**	**9.08**	**9.09**	**9.09**	**9.09**	**9.09**	**9.09**	**9.09**	**9.09**	**9.09**	**9.09**	**9.09**
1996	0.01	0.48	2.10	3.69	4.49	4.79	5.06	5.14	5.23	5.27	5.31	5.32	5.34	5.35	**5.40**	**5.41**	**5.42**	**5.43**	**5.43**	**5.43**	**5.43**	**5.44**	**5.44**	**5.44**	**5.44**	**5.44**	**5.44**	**5.44**	**5.44**	**5.44**
1997	0.04	0.72	2.06	3.25	3.87	4.18	4.40	4.47	4.54	4.58	4.61	4.63	4.66	**4.71**	**4.72**	**4.73**	**4.74**	**4.75**	**4.75**	**4.75**	**4.75**	**4.75**	**4.75**	**4.75**	**4.75**	**4.75**	**4.75**	**4.75**	**4.75**	**4.75**
1998	0.06	0.51	1.28	1.87	2.27	2.52	2.67	2.74	2.77	2.78	2.80	2.81	**2.84**	**2.85**	**2.86**	**2.87**	**2.87**	**2.88**	**2.88**	**2.88**	**2.88**	**2.88**	**2.88**	**2.88**	**2.88**	**2.88**	**2.88**	**2.88**	**2.88**	**2.88**
1999	0.00	0.20	0.66	1.27	2.20	2.60	2.83	2.91	3.00	3.04	3.11	**3.14**	**3.20**	**3.25**	**3.28**	**3.29**	**3.30**	**3.31**	**3.31**	**3.31**	**3.31**	**3.31**	**3.31**	**3.31**	**3.31**	**3.31**	**3.31**	**3.31**	**3.31**	**3.31**
2000	0.02	0.44	1.71	4.01	5.23	6.14	6.56	6.84	7.05	7.13	**7.50**	**7.65**	**7.78**	**7.86**	**7.92**	**7.95**	**7.96**	**7.97**	**7.98**	**7.98**	**7.98**	**7.98**	**7.98**	**7.98**	**7.98**	**7.98**	**7.98**	**7.98**	**7.98**	**7.98**
2001	0.00	0.27	2.08	3.67	4.63	5.25	5.54	6.01	6.45	**6.79**	**6.97**	**7.11**	**7.19**	**7.23**	**7.26**	**7.27**	**7.27**	**7.28**	**7.28**	**7.28**	**7.28**	**7.28**	**7.28**	**7.28**	**7.28**	**7.28**	**7.28**	**7.28**	**7.28**	**7.28**
2002	0.01	0.44	1.47	2.34	3.04	3.63	4.21	4.70	**5.17**	**5.49**	**5.71**	**5.85**	**5.92**	**5.95**	**5.97**	**5.98**	**5.98**	**5.98**	**5.98**	**5.98**	**5.98**	**5.98**	**5.99**	**5.99**	**5.99**	**5.99**	**5.99**	**5.99**	**5.99**	**5.99**
2003	0.03	0.70	1.93	2.97	3.74	4.58	5.19	**5.82**	**6.32**	**6.67**	**6.89**	**7.00**	**7.06**	**7.09**	**7.10**	**7.11**	**7.11**	**7.11**	**7.11**	**7.11**	**7.11**	**7.11**	**7.11**	**7.11**	**7.11**	**7.11**	**7.11**	**7.11**	**7.11**	**7.11**
2004	0.07	1.00	2.66	4.21	5.85	7.29	**8.46**	**9.66**	**10.55**	**11.09**	**11.41**	**11.56**	**11.63**	**11.67**	**11.69**	**11.69**	**11.70**	**11.70**	**11.70**	**11.70**	**11.70**	**11.70**	**11.70**	**11.70**	**11.70**	**11.70**	**11.70**	**11.70**	**11.70**	**11.70**
2005	0.14	1.69	4.08	6.50	8.93	**10.94**	**13.45**	**15.38**	**16.61**	**17.37**	**17.77**	**17.95**	**18.04**	**18.09**	**18.12**	**18.13**	**18.14**	**18.14**	**18.14**	**18.14**	**18.14**	**18.14**	**18.14**	**18.14**	**18.14**	**18.14**	**18.14**	**18.14**	**18.14**	**18.14**
2006	0.23	2.54	6.24	10.40	**15.25**	**19.52**	**22.97**	**25.17**	**26.53**	**27.25**	**27.63**	**27.81**	**27.91**	**27.96**	**27.98**	**27.99**	**28.00**	**28.00**	**28.01**	**28.01**	**28.01**	**28.01**	**28.01**	**28.01**	**28.01**	**28.01**	**28.01**	**28.01**	**28.01**	**28.01**
2007	0.00	1.98	5.16	**14.21**	**20.68**	**25.62**	**28.75**	**30.65**	**31.63**	**32.16**	**32.41**	**32.55**	**32.61**	**32.65**	**32.66**	**32.67**	**32.68**	**32.68**	**32.68**	**32.68**	**32.68**	**32.68**	**32.68**	**32.68**	**32.68**	**32.68**	**32.68**	**32.68**	**32.68**	**32.68**
2008	0.00	1.06	**6.06**	**16.96**	**25.84**	**31.80**	**35.57**	**37.66**	**38.80**	**39.43**	**39.76**	**39.93**	**40.01**	**40.05**	**40.07**	**40.08**	**40.08**	**40.09**	**40.09**	**40.09**	**40.09**	**40.09**	**40.09**	**40.09**	**40.09**	**40.09**	**40.09**	**40.09**	**40.09**	**40.09**
2009	0.02	**1.02**	**9.31**	**19.49**	**28.18**	**34.37**	**38.13**	**40.23**	**41.42**	**42.08**	**42.43**	**42.62**	**42.71**	**42.75**	**42.78**	**42.79**	**42.79**	**42.80**	**42.80**	**42.80**	**42.80**	**42.80**	**42.80**	**42.80**	**42.80**	**42.80**	**42.80**	**42.80**	**42.80**	**42.80**
2010	**0.18**	**4.71**	**12.74**	**21.22**	**27.76**	**31.84**	**34.14**	**35.42**	**36.11**	**36.47**	**36.65**	**36.73**	**36.77**	**36.79**	**36.80**	**36.81**	**36.81**	**36.81**	**36.81**	**36.81**	**36.81**	**36.81**	**36.81**	**36.81**	**36.81**	**36.81**	**36.81**	**36.81**	**36.81**	**36.81**
2011	**0.96**	**5.15**	**12.49**	**19.29**	**23.46**	**25.74**	**26.90**	**27.49**	**27.78**	**27.92**	**27.98**	**28.01**	**28.03**	**28.04**	**28.04**	**28.04**	**28.04**	**28.04**	**28.04**	**28.04**	**28.04**	**28.04**	**28.04**	**28.04**	**28.04**	**28.04**	**28.04**	**28.04**	**28.04**	**28.04**
2012	**0.82**	**4.75**	**9.87**	**13.61**	**15.76**	**16.91**	**17.49**	**17.79**	**17.93**	**17.99**	**18.02**	**18.04**	**18.05**	**18.05**	**18.05**	**18.05**	**18.05**	**18.05**	**18.05**	**18.05**	**18.05**	**18.05**	**18.05**	**18.05**	**18.05**	**18.05**	**18.05**	**18.05**	**18.05**	**18.05**
2013	**0.68**	**2.89**	**5.61**	**7.66**	**8.88**	**9.54**	**9.88**	**10.05**	**10.12**	**10.16**	**10.18**	**10.19**	**10.19**	**10.20**	**10.20**	**10.20**	**10.20**	**10.20**	**10.20**	**10.20**	**10.20**	**10.20**	**10.20**	**10.20**	**10.20**	**10.20**	**10.20**	**10.20**	**10.20**	**10.20**
2014	**0.51**	**2.18**	**4.31**	**5.95**	**6.92**	**7.45**	**7.72**	**7.83**	**7.89**	**7.93**	**7.94**	**7.95**	**7.96**	**7.96**	**7.96**	**7.96**	**7.96**	**7.96**	**7.96**	**7.96**	**7.96**	**7.96**	**7.96**	**7.96**	**7.96**	**7.96**	**7.96**	**7.96**	**7.96**	**7.96**
2015	**0.42**	**1.89**	**3.82**	**5.34**	**6.26**	**6.73**	**6.95**	**7.06**	**7.12**	**7.15**	**7.17**	**7.18**	**7.18**	**7.18**	**7.19**	**7.19**	**7.19**	**7.19**	**7.19**	**7.19**	**7.19**	**7.19**	**7.19**	**7.19**	**7.19**	**7.19**	**7.19**	**7.19**	**7.19**	**7.19**
2016	**0.44**	**1.93**	**3.84**	**5.34**	**6.22**	**6.63**	**6.86**	**6.99**	**7.05**	**7.08**	**7.10**	**7.11**	**7.11**	**7.11**	**7.11**	**7.11**	**7.12**	**7.12**	**7.12**	**7.12**	**7.12**	**7.12**	**7.12**	**7.12**	**7.12**	**7.12**	**7.12**	**7.12**	**7.12**	**7.12**
2017	**0.42**	**1.81**	**3.61**	**4.97**	**5.69**	**6.12**	**6.36**	**6.49**	**6.55**	**6.58**	**6.60**	**6.61**	**6.61**	**6.62**	**6.62**	**6.62**	**6.62**	**6.62**	**6.62**	**6.62**	**6.62**	**6.62**	**6.62**	**6.62**	**6.62**	**6.62**	**6.62**	**6.62**	**6.62**	**6.62**

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
1993	2.90	12.70	20.69	30.95	38.68	49.32	57.93	63.30	70.66	76.77	81.95	84.48	85.99	87.30	88.19	88.82	89.25	**89.44**	**89.77**	**90.09**	**90.74**	**91.47**	**92.13**	**92.56**	**92.88**	**93.19**	**93.42**	**93.59**	**93.72**	**93.81**
1994	3.66	10.46	20.57	28.56	39.25	48.37	53.90	61.73	68.55	74.90	78.47	80.83	82.54	83.77	84.53	85.16	**85.43**	**85.84**	**86.23**	**87.01**	**87.88**	**88.65**	**89.16**	**89.55**	**89.89**	**90.14**	**90.33**	**90.46**	**90.56**	**90.62**
1995	4.48	21.13	31.76	44.72	52.62	57.64	64.97	71.07	75.79	78.84	80.79	82.31	83.69	84.48	84.87	**85.28**	**85.70**	**86.10**	**86.93**	**87.86**	**88.64**	**89.16**	**89.56**	**89.92**	**90.20**	**90.40**	**90.55**	**90.65**	**90.72**	**90.78**
1996	4.56	24.92	54.59	68.75	73.11	79.23	83.69	87.05	89.16	90.43	91.37	91.90	92.26	92.45	**92.59**	**92.84**	**93.07**	**93.47**	**93.86**	**94.12**	**94.28**	**94.38**	**94.45**	**94.49**	**94.52**	**94.54**	**94.55**	**94.55**	**94.56**	**94.56**
1997	8.95	47.98	66.47	71.94	79.47	83.93	87.70	89.77	91.15	92.12	92.78	93.05	93.15	**93.27**	**93.52**	**93.75**	**94.17**	**94.56**	**94.83**	**94.98**	**95.08**	**95.14**	**95.19**	**95.21**	**95.23**	**95.24**	**95.24**	**95.24**	**95.25**	**95.25**
1998	15.70	51.71	62.47	77.28	84.28	89.03	91.57	93.26	94.25	94.94	95.28	95.41	**95.49**	**95.70**	**95.89**	**96.23**	**96.55**	**96.77**	**96.90**	**96.97**	**97.03**	**97.07**	**97.09**	**97.10**	**97.11**	**97.11**	**97.12**	**97.12**	**97.12**	**97.12**
1999	5.90	17.05	44.58	61.33	73.62	80.54	85.39	88.66	90.66	91.74	92.24	**92.60**	**93.12**	**93.61**	**94.49**	**95.29**	**95.84**	**96.14**	**96.34**	**96.47**	**96.56**	**96.61**	**96.64**	**96.66**	**96.67**	**96.68**	**96.68**	**96.69**	**96.69**	**96.69**
2000	3.44	25.63	41.75	53.04	62.19	69.62	76.20	80.80	82.47	82.85	**83.37**	**84.22**	**85.03**	**86.59**	**88.12**	**89.38**	**90.17**	**90.71**	**91.15**	**91.45**	**91.65**	**91.78**	**91.87**	**91.92**	**91.95**	**91.97**	**91.99**	**92.00**	**92.00**	**92.01**
2001	5.23	34.15	52.03	63.40	72.85	79.22	83.25	84.96	85.44	**85.79**	**86.51**	**87.21**	**88.59**	**89.92**	**90.93**	**91.51**	**91.90**	**92.20**	**92.39**	**92.51**	**92.59**	**92.64**	**92.67**	**92.69**	**92.70**	**92.70**	**92.71**	**92.71**	**92.71**	**92.71**
2002	8.23	38.39	54.52	67.98	77.07	83.29	85.76	86.48	**86.90**	**87.63**	**88.35**	**89.77**	**91.18**	**92.25**	**92.86**	**93.26**	**93.55**	**93.74**	**93.85**	**93.92**	**93.96**	**93.98**	**93.99**	**94.00**	**94.01**	**94.01**	**94.01**	**94.01**	**94.01**	**94.01**
2003	13.84	36.00	56.53	70.48	79.09	82.58	83.51	**84.16**	**85.07**	**85.94**	**87.62**	**89.30**	**90.64**	**91.44**	**91.95**	**92.31**	**92.54**	**92.68**	**92.77**	**92.81**	**92.84**	**92.86**	**92.87**	**92.88**	**92.88**	**92.88**	**92.88**	**92.89**	**92.89**	**92.89**
2004	8.04	33.52	53.00	66.00	71.56	73.02	**74.01**	**75.43**	**76.78**	**79.44**	**82.18**	**84.37**	**85.69**	**86.57**	**87.24**	**87.65**	**87.91**	**88.06**	**88.16**	**88.21**	**88.24**	**88.26**	**88.27**	**88.28**	**88.29**	**88.29**	**88.29**	**88.29**	**88.29**	**88.30**
2005	11.37	31.39	46.22	54.87	56.83	**58.17**	**60.25**	**62.21**	**66.08**	**70.38**	**73.94**	**76.29**	**78.00**	**79.38**	**80.29**	**80.87**	**81.25**	**81.47**	**81.61**	**81.70**	**81.76**	**81.79**	**81.81**	**81.83**	**81.84**	**81.84**	**81.85**	**81.85**	**81.85**	**81.85**
2006	7.40	23.01	35.95	41.62	**43.88**	**46.31**	**48.46**	**52.76**	**57.57**	**62.04**	**64.88**	**67.01**	**68.75**	**69.91**	**70.66**	**71.14**	**71.44**	**71.64**	**71.76**	**71.84**	**71.89**	**71.92**	**71.94**	**71.96**	**71.97**	**71.97**	**71.98**	**71.98**	**71.99**	**71.99**
2007	7.14	23.41	38.89	**44.57**	**46.31**	**47.83**	**50.94**	**54.52**	**57.78**	**60.12**	**62.03**	**63.66**	**64.86**	**65.68**	**66.24**	**66.60**	**66.84**	**66.99**	**67.10**	**67.17**	**67.21**	**67.24**	**67.26**	**67.28**	**67.29**	**67.30**	**67.30**	**67.31**	**67.31**	**67.31**
2008	3.26	29.82	**35.34**	**37.42**	**39.08**	**42.15**	**45.55**	**48.68**	**50.97**	**52.89**	**54.75**	**56.26**	**57.43**	**58.26**	**58.82**	**59.19**	**59.44**	**59.60**	**59.70**	**59.77**	**59.82**	**59.85**	**59.87**	**59.88**	**59.89**	**59.90**	**59.90**	**59.91**	**59.91**	**59.91**
2009	3.14	**10.20**	**15.61**	**19.75**	**27.03**	**34.55**	**40.97**	**45.05**	**48.16**	**50.90**	**52.92**	**54.35**	**55.34**	**55.99**	**56.42**	**56.70**	**56.89**	**57.00**	**57.07**	**57.12**	**57.15**	**57.17**	**57.18**	**57.19**	**57.19**	**57.20**	**57.20**	**57.20**	**57.20**	**57.20**
2010	**2.49**	**9.64**	**15.07**	**25.34**	**36.41**	**44.49**	**49.71**	**53.52**	**56.66**	**58.91**	**60.43**	**61.45**	**62.10**	**62.51**	**62.77**	**62.94**	**63.04**	**63.09**	**63.13**	**63.15**	**63.17**	**63.17**	**63.18**	**63.18**	**63.18**	**63.19**	**63.19**	**63.19**	**63.19**	**63.19**
2011	**5.68**	**13.19**	**28.28**	**44.37**	**53.82**	**59.90**	**63.95**	**66.67**	**68.55**	**69.85**	**70.67**	**71.12**	**71.43**	**71.62**	**71.75**	**71.82**	**71.87**	**71.90**	**71.92**	**71.93**	**71.94**	**71.95**	**71.95**	**71.95**	**71.95**	**71.95**	**71.95**	**71.95**	**71.95**	**71.96**
2012	**7.57**	**31.68**	**51.56**	**63.24**	**69.94**	**74.15**	**76.90**	**78.76**	**80.01**	**80.77**	**81.19**	**81.46**	**81.64**	**81.75**	**81.82**	**81.86**	**81.89**	**81.91**	**81.92**	**81.93**	**81.94**	**81.94**	**81.94**	**81.94**	**81.94**	**81.94**	**81.94**	**81.94**	**81.95**	**81.95**
2013	**20.99**	**49.90**	**66.56**	**75.92**	**81.12**	**84.33**	**86.42**	**87.78**	**88.59**	**89.02**	**89.30**	**89.48**	**89.60**	**89.67**	**89.71**	**89.74**	**89.76**	**89.77**	**89.78**	**89.79**	**89.79**	**89.79**	**89.80**	**89.80**	**89.80**	**89.80**	**89.80**	**89.80**	**89.80**	**89.80**
2014	**24.78**	**53.80**	**70.00**	**78.99**	**84.03**	**87.19**	**89.19**	**90.34**	**90.95**	**91.34**	**91.59**	**91.75**	**91.85**	**91.91**	**91.96**	**91.98**	**92.00**	**92.01**	**92.02**	**92.03**	**92.03**	**92.03**	**92.03**	**92.03**	**92.04**	**92.04**	**92.04**	**92.04**	**92.04**	**92.04**
2015	**25.61**	**54.81**	**70.99**	**80.10**	**85.30**	**88.48**	**90.30**	**91.23**	**91.81**	**92.17**	**92.40**	**92.55**	**92.64**	**92.70**	**92.74**	**92.76**	**92.78**	**92.79**	**92.80**	**92.80**	**92.80**	**92.81**	**92.81**	**92.81**	**92.81**	**92.81**	**92.81**	**92.81**	**92.81**	**92.81**
2016	**25.34**	**54.83**	**71.35**	**80.71**	**85.90**	**88.86**	**90.35**	**91.26**	**91.84**	**92.22**	**92.45**	**92.60**	**92.69**	**92.76**	**92.80**	**92.83**	**92.85**	**92.86**	**92.86**	**92.87**	**92.87**	**92.88**	**92.88**	**92.88**	**92.88**	**92.88**	**92.88**	**92.88**	**92.88**	**92.88**
2017	**26.01**	**56.00**	**73.02**	**82.40**	**87.27**	**89.54**	**90.93**	**91.82**	**92.38**	**92.72**	**92.95**	**93.10**	**93.20**	**93.27**	**93.31**	**93.33**	**93.35**	**93.36**	**93.36**	**93.37**	**93.37**	**93.38**	**93.38**	**93.38**	**93.38**	**93.38**	**93.38**	**93.38**	**93.38**	**93.38**

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
1981	44.90	42.53	41.59	44.61	35.56	42.16	47.45	51.10	48.56	49.15	47.55	47.30	44.92	46.24	41.93	49.01	59.36	59.26	66.10	78.11	64.44	62.23	95.61	85.28	64.42	100.76	220.55	157.93	290.76	**107.12**
1982	41.69	41.60	47.44	37.82	44.99	52.57	57.05	57.52	55.11	59.15	60.97	52.36	63.43	73.47	73.38	74.24	71.52	74.90	88.36	98.52	119.10	69.32	108.72	70.39	110.10	167.44	275.99	101.72	**113.56**	**108.14**
1983	36.31	44.71	36.36	43.29	48.24	49.27	47.50	45.60	45.45	43.22	39.92	39.98	42.60	46.33	53.05	56.69	58.87	62.83	62.03	62.53	60.98	60.35	99.09	101.90	154.64	154.01	159.64	**120.67**	**113.57**	**106.50**
1984	38.12	35.56	44.75	48.49	50.98	50.37	48.48	47.90	47.59	46.94	46.02	46.49	53.27	71.70	68.00	66.26	68.13	60.56	78.91	65.31	69.15	67.17	128.37	161.82	129.78	177.90	**146.71**	**102.72**	**95.99**	**91.15**
1985	33.54	46.62	49.74	50.48	48.68	47.50	47.70	45.76	44.35	45.10	43.53	47.35	55.44	61.04	71.32	57.94	64.40	77.05	52.38	73.22	69.32	113.37	90.68	135.09	140.65	**110.47**	**103.73**	**98.36**	**93.44**	**91.34**
1986	43.97	48.34	48.57	45.81	43.41	41.48	38.97	36.40	34.76	35.67	33.81	38.46	43.85	45.45	42.13	47.47	48.57	49.24	51.23	63.83	61.04	79.85	126.39	83.57	**78.70**	**72.41**	**66.84**	**61.89**	**59.43**	**60.27**
1987	48.56	45.93	43.61	40.89	39.79	37.01	34.15	31.82	31.08	31.54	34.73	40.44	42.99	41.88	40.38	46.16	48.20	46.26	56.38	69.45	82.98	97.08	96.92	**79.78**	**73.09**	**67.07**	**61.96**	**59.41**	**60.32**	**63.93**
1988	49.67	40.06	38.99	39.19	37.85	36.48	34.96	35.99	36.51	39.13	46.17	47.47	47.45	48.63	49.79	47.21	53.37	62.05	66.90	96.56	101.52	98.50	**94.60**	**74.75**	**68.27**	**62.72**	**59.86**	**60.69**	**64.31**	**64.29**
1989	44.76	39.88	37.45	37.43	37.43	37.17	38.49	38.62	42.10	47.72	50.72	48.58	46.65	47.70	49.09	53.44	58.57	73.76	102.12	132.55	104.14	**79.36**	**73.64**	**68.73**	**64.23**	**62.15**	**63.46**	**67.26**	**67.39**	**67.44**
1990	41.73	35.83	35.29	37.35	38.88	40.24	41.45	45.47	50.23	51.75	49.58	48.72	52.31	51.32	51.43	59.60	72.53	97.41	109.86	85.32	**78.27**	**73.10**	**68.36**	**63.96**	**61.81**	**63.32**	**67.17**	**67.36**	**67.52**	**67.57**
1991	34.13	32.40	34.40	37.77	39.94	41.59	46.97	51.95	51.77	47.61	47.32	45.40	44.63	49.60	58.19	79.67	89.36	114.82	99.25	**85.25**	**78.30**	**72.11**	**66.84**	**64.05**	**64.94**	**68.53**	**68.56**	**68.61**	**68.61**	**68.72**
1992	30.50	31.48	33.09	35.28	36.85	43.52	48.09	48.20	44.31	40.71	38.47	33.44	40.97	48.64	60.24	85.69	101.52	82.00	**77.12**	**66.33**	**60.41**	**55.42**	**52.99**	**54.11**	**57.78**	**57.88**	**57.95**	**57.95**	**58.12**	**58.36**
1993	25.20	26.75	30.56	32.93	39.98	44.29	43.16	39.51	34.85	32.47	30.23	35.67	44.61	60.51	69.38	84.23	78.32	**86.84**	**64.66**	**59.53**	**54.98**	**52.72**	**53.99**	**57.81**	**58.00**	**58.14**	**58.19**	**58.34**	**58.52**	**58.32**
1994	23.91	26.33	30.50	36.74	42.03	40.17	36.50	31.80	30.43	27.70	31.27	42.81	52.22	68.13	85.56	67.01	**78.47**	**66.08**	**60.28**	**55.38**	**52.87**	**53.89**	**57.55**	**57.63**	**57.68**	**57.68**	**57.84**	**58.10**	**58.22**	**58.46**
1995	23.96	25.39	35.23	41.21	40.98	39.56	35.10	34.13	31.88	34.94	42.19	49.41	78.19	83.63	71.23	**78.48**	**63.56**	**58.33**	**53.95**	**51.79**	**53.22**	**57.10**	**57.32**	**57.47**	**57.56**	**57.78**	**57.90**	**57.84**	**57.79**	**57.58**
1996	21.16	37.43	37.87	37.83	35.95	33.70	31.73	29.44	31.97	39.41	50.45	65.89	78.22	76.33	**77.10**	**66.63**	**60.92**	**55.93**	**53.41**	**54.62**	**58.49**	**58.71**	**58.89**	**58.99**	**59.25**	**59.53**	**59.62**	**59.73**	**59.85**	**60.01**
1997	33.12	37.64	36.22	35.62	33.61	32.90	28.68	33.91	38.31	49.76	64.93	80.52	71.15	**81.64**	**67.86**	**62.20**	**57.22**	**54.82**	**56.02**	**59.91**	**60.20**	**60.41**	**60.51**	**60.82**	**61.18**	**61.31**	**61.45**	**61.57**	**61.71**	**61.58**
1998	35.89	34.36	31.58	30.25	30.12	27.27	30.62	36.09	47.05	64.66	74.37	72.23	**79.70**	**67.29**	**61.57**	**56.46**	**53.68**	**54.81**	**58.55**	**58.72**	**58.86**	**58.98**	**59.19**	**59.43**	**59.50**	**59.58**	**59.65**	**59.69**	**59.55**	**59.35**
1999	36.16	30.92	29.69	29.33	26.78	30.25	35.13	43.63	60.00	71.44	67.11	**84.59**	**69.05**	**62.56**	**56.57**	**53.11**	**53.91**	**57.58**	**57.72**	**57.83**	**57.92**	**58.11**	**58.33**	**58.43**	**58.52**	**58.59**	**58.67**	**58.59**	**58.57**	**58.57**
2000	28.50	30.25	29.84	30.32	33.21	37.54	46.48	60.28	74.72	70.57	**83.04**	**72.38**	**65.56**	**58.66**	**54.85**	**54.71**	**58.07**	**58.18**	**58.41**	**58.58**	**58.91**	**59.25**	**59.46**	**59.68**	**59.88**	**60.05**	**60.06**	**60.11**	**60.20**	**60.23**
2001	26.40	29.89	30.50	34.59	37.72	45.84	59.02	70.70	69.36	**78.06**	**72.46**	**71.18**	**63.69**	**58.02**	**57.29**	**59.16**	**58.88**	**58.79**	**58.91**	**59.13**	**59.40**	**59.49**	**59.61**	**59.71**	**59.82**	**59.73**	**59.69**	**59.69**	**59.64**	**59.50**
2002	25.17	28.57	32.09	35.83	42.34	53.30	64.31	63.47	**77.63**	**67.21**	**67.58**	**65.13**	**58.78**	**56.95**	**58.60**	**57.36**	**57.28**	**57.31**	**57.51**	**57.74**	**57.86**	**57.94**	**58.08**	**58.18**	**58.13**	**58.14**	**58.19**	**58.24**	**58.28**	**58.36**
2003	26.14	26.51	28.52	37.93	49.31	58.46	58.51	**72.59**	**65.81**	**62.78**	**63.40**	**61.34**	**58.12**	**59.31**	**56.91**	**56.32**	**56.13**	**56.15**	**56.32**	**56.37**	**56.39**	**56.40**	**56.41**	**56.26**	**56.19**	**56.17**	**56.14**	**56.11**	**56.07**	**55.99**
2004	10.78	21.06	37.04	48.02	57.57	58.08	**71.23**	**64.98**	**62.18**	**58.60**	**61.32**	**60.83**	**61.24**	**58.54**	**56.66**	**56.05**	**55.77**	**55.76**	**55.71**	**55.74**	**55.80**	**55.84**	**55.73**	**55.69**	**55.70**	**55.70**	**55.69**	**55.68**	**55.68**	**55.74**
2005	13.36	36.17	47.22	57.19	57.22	**67.36**	**60.96**	**58.90**	**56.47**	**54.55**	**59.67**	**63.10**	**60.00**	**56.66**	**54.08**	**53.00**	**52.38**	**52.09**	**51.86**	**51.80**	**51.76**	**51.65**	**51.66**	**51.66**	**51.63**	**51.57**	**51.46**	**51.30**	**51.05**	**50.32**
2006	37.76	44.29	55.33	56.92	**66.77**	**58.60**	**56.58**	**54.67**	**54.14**	**56.15**	**64.02**	**65.18**	**62.15**	**59.22**	**56.21**	**54.52**	**53.16**	**52.34**	**51.71**	**51.32**	**50.82**	**50.65**	**50.58**	**50.62**	**50.62**	**50.61**	**50.61**	**50.63**	**50.62**	**50.56**
2007	35.36	51.68	55.40	**63.60**	**56.75**	**54.87**	**53.21**	**53.29**	**56.24**	**60.82**	**65.57**	**67.16**	**63.78**	**61.64**	**58.57**	**56.27**	**54.83**	**53.68**	**52.56**	**51.88**	**51.19**	**50.93**	**50.93**	**50.98**	**51.00**	**51.01**	**51.06**	**51.06**	**50.94**	**50.81**
2008	40.83	48.85	**58.98**	**53.06**	**52.06**	**50.33**	**50.22**	**53.91**	**59.55**	**60.61**	**64.99**	**66.71**	**63.80**	**60.96**	**57.72**	**55.02**	**53.17**	**52.26**	**51.34**	**51.13**	**51.02**	**51.02**	**51.03**	**51.00**	**50.94**	**50.88**	**50.78**	**50.64**	**50.47**	**50.25**
2009	35.02	**52.13**	**46.58**	**45.47**	**43.13**	**42.82**	**46.33**	**51.76**	**53.60**	**54.01**	**58.25**	**59.54**	**56.23**	**53.26**	**50.86**	**49.75**	**49.60**	**49.43**	**49.34**	**49.30**	**49.26**	**49.21**	**49.15**	**49.08**	**48.96**	**48.83**	**48.72**	**48.58**	**48.43**	**48.20**
2010	**42.41**	**40.12**	**40.19**	**37.99**	**37.25**	**39.89**	**44.69**	**45.44**	**46.47**	**46.82**	**50.27**	**52.65**	**49.59**	**48.07**	**47.90**	**47.87**	**47.78**	**47.77**	**47.80**	**47.80**	**47.79**	**47.77**	**47.74**	**47.67**	**47.60**	**47.52**	**47.45**	**47.36**	**47.27**	**47.16**
2011	**32.37**	**37.32**	**34.99**	**34.10**	**37.36**	**41.85**	**42.87**	**44.19**	**45.24**	**45.71**	**51.12**	**52.11**	**50.16**	**49.22**	**48.76**	**48.49**	**48.41**	**48.42**	**48.42**	**48.42**	**48.41**	**48.39**	**48.35**	**48.29**	**48.22**	**48.13**	**48.04**	**47.95**	**47.89**	**47.93**
2012	**32.63**	**32.33**	**31.90**	**34.96**	**40.23**	**41.61**	**42.90**	**44.71**	**46.75**	**47.94**	**52.87**	**55.85**	**54.22**	**53.37**	**52.77**	**52.31**	**52.48**	**52.92**	**53.29**	**53.63**	**53.91**	**54.15**	**54.35**	**54.55**	**54.72**	**54.77**	**54.77**	**54.69**	**54.55**	**54.31**
2013	**27.25**	**30.01**	**32.61**	**37.88**	**39.06**	**39.89**	**40.95**	**42.59**	**43.78**	**44.72**	**48.98**	**51.67**	**50.13**	**49.01**	**48.64**	**48.25**	**48.16**	**48.15**	**48.15**	**48.15**	**48.14**	**48.12**	**48.10**	**48.08**	**47.98**	**47.89**	**47.77**	**47.64**	**47.51**	**47.32**
2014	**25.53**	**31.78**	**35.79**	**37.69**	**39.18**	**39.93**	**41.38**	**42.93**	**43.50**	**44.88**	**49.10**	**51.63**	**49.88**	**49.18**	**49.10**	**49.04**	**49.07**	**49.13**	**49.16**	**49.19**	**49.20**	**49.20**	**49.18**	**49.14**	**49.08**	**49.01**	**48.90**	**48.78**	**48.63**	**48.41**
2015	**28.23**	**33.65**	**35.07**	**37.14**	**38.51**	**39.23**	**40.54**	**41.90**	**42.33**	**43.54**	**48.00**	**50.14**	**48.40**	**48.12**	**48.06**	**47.99**	**48.04**	**48.07**	**48.07**	**48.09**	**48.10**	**48.10**	**48.06**	**48.02**	**47.99**	**47.90**	**47.78**	**47.66**	**47.53**	**47.40**
2016	**29.18**	**33.84**	**35.10**	**37.27**	**39.23**	**39.70**	**41.26**	**42.60**	**43.00**	**44.15**	**48.46**	**50.43**	**48.65**	**48.35**	**48.27**	**48.13**	**48.14**	**48.21**	**48.26**	**48.33**	**48.38**	**48.39**	**48.39**	**48.37**	**48.33**	**48.29**	**48.23**	**48.16**	**48.08**	**47.98**
2017	**30.99**	**34.09**	**35.05**	**37.51**	**39.54**	**39.25**	**41.34**	**42.63**	**42.88**	**44.17**	**48.62**	**50.38**	**48.61**	**48.36**	**48.10**	**47.77**	**47.77**	**47.83**	**47.87**	**47.86**	**47.88**	**47.89**	**47.88**	**47.89**	**47.89**	**47.85**	**47.79**	**47.71**	**47.64**	**47.55**

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
1981	44.90	42.42	41.50	44.60	35.54	42.18	47.43	51.06	48.57	49.11	47.48	47.08	44.93	46.23	41.93	49.01	59.36	59.26	66.10	78.11	64.44	62.23	95.61	85.28	64.42	100.76	220.55	157.93	290.76	**107.12**
1982	41.69	41.49	47.36	37.79	44.95	52.54	57.07	57.20	55.10	58.97	60.93	52.36	63.43	73.47	73.38	74.24	71.52	74.90	88.36	98.52	119.10	69.32	108.72	70.39	110.10	167.44	275.99	101.72	**113.56**	**108.14**
1983	35.97	44.75	36.40	43.15	48.19	49.21	47.49	45.65	45.45	43.34	40.03	39.89	42.70	46.25	52.65	56.69	58.87	62.83	62.03	62.53	60.98	60.35	99.09	101.90	154.64	154.01	159.64	**120.67**	**113.57**	**106.50**
1984	38.64	35.53	44.87	48.43	50.79	50.39	48.33	47.82	47.74	46.95	45.98	46.47	52.69	71.59	67.64	65.80	68.13	60.55	78.91	65.31	69.15	67.17	128.37	161.82	129.78	177.90	**146.71**	**102.72**	**95.99**	**91.15**
1985	33.18	46.64	49.74	50.46	48.67	47.43	47.72	45.76	44.32	44.95	43.55	47.38	55.10	60.22	71.09	57.17	64.40	77.71	52.38	73.22	66.91	113.37	90.68	135.09	140.65	**110.47**	**103.73**	**98.36**	**93.44**	**91.34**
1986	44.35	48.42	48.63	45.85	43.40	41.45	39.13	36.43	34.87	35.47	33.85	38.32	43.74	45.35	42.07	47.60	48.47	49.23	51.40	65.03	61.04	79.85	126.39	85.55	**78.76**	**72.49**	**66.91**	**61.95**	**59.47**	**60.30**
1987	48.56	46.02	43.44	40.78	39.98	37.06	34.21	32.26	31.24	31.96	34.86	40.69	43.64	42.52	40.65	46.37	49.01	47.41	55.57	72.10	80.62	99.93	99.39	**79.88**	**73.22**	**67.19**	**62.08**	**59.51**	**60.42**	**64.03**
1988	48.98	40.00	38.81	39.32	37.79	36.50	35.23	36.11	36.89	38.75	46.65	47.90	47.79	48.84	50.31	47.77	53.61	62.10	65.67	97.50	101.54	99.34	**94.71**	**75.05**	**68.57**	**63.04**	**60.13**	**60.96**	**64.56**	**64.52**
1989	46.03	39.43	37.38	37.46	37.56	37.14	38.61	38.97	42.20	47.65	50.78	48.50	47.45	47.98	48.67	53.69	58.43	73.76	104.79	135.84	103.39	**79.41**	**73.74**	**68.88**	**64.42**	**62.36**	**63.67**	**67.46**	**67.58**	**67.62**
1990	43.15	35.79	35.30	37.45	39.04	40.40	41.60	45.44	50.12	52.07	49.57	48.72	51.95	51.22	51.66	59.55	73.05	97.37	110.29	85.14	**78.15**	**72.97**	**68.32**	**63.96**	**61.83**	**63.36**	**67.22**	**67.42**	**67.58**	**67.65**
1991	33.93	32.16	34.57	37.83	39.96	41.94	47.29	51.88	52.11	48.17	48.34	44.96	45.18	50.75	56.79	78.90	90.98	115.86	98.82	**85.56**	**78.69**	**72.51**	**67.27**	**64.44**	**65.33**	**68.90**	**68.91**	**68.96**	**69.02**	**69.15**
1992	31.49	31.30	33.34	35.46	37.53	43.96	48.78	49.59	45.19	41.36	41.00	33.47	42.28	51.39	62.61	86.83	102.22	79.48	**77.75**	**67.12**	**61.26**	**56.43**	**54.02**	**55.17**	**58.77**	**58.85**	**58.93**	**59.02**	**59.19**	**59.36**
1993	25.55	25.05	28.42	31.09	38.41	43.18	42.90	39.43	36.32	33.00	30.67	36.86	45.34	59.57	71.48	89.55	77.43	**89.88**	**65.21**	**60.29**	**56.00**	**53.79**	**55.10**	**58.90**	**59.07**	**59.20**	**59.27**	**59.43**	**59.50**	**59.11**
1994	23.31	21.31	26.01	32.91	40.33	40.37	37.61	33.41	32.09	28.31	32.49	43.94	55.98	67.09	85.99	68.38	**73.68**	**67.19**	**61.46**	**56.75**	**54.11**	**55.07**	**58.67**	**58.71**	**58.77**	**58.83**	**58.98**	**59.17**	**59.19**	**59.37**
1995	23.27	22.79	33.38	40.65	42.21	41.31	36.70	36.43	33.25	36.02	42.95	50.27	77.40	84.40	70.99	**79.19**	**63.60**	**58.42**	**54.14**	**52.03**	**53.52**	**57.40**	**57.61**	**57.77**	**57.89**	**58.10**	**58.18**	**58.04**	**57.92**	**57.63**
1996	18.81	35.84	37.63	39.13	37.09	34.95	32.86	31.31	32.61	40.18	51.08	65.59	78.49	77.00	**78.41**	**67.71**	**61.85**	**56.96**	**54.34**	**55.51**	**59.25**	**59.40**	**59.54**	**59.67**	**59.89**	**60.08**	**60.07**	**60.09**	**60.12**	**60.22**
1997	30.12	36.37	37.11	37.11	35.11	34.59	30.77	34.77	39.30	51.34	65.27	80.52	71.90	**82.48**	**69.09**	**63.47**	**58.68**	**56.32**	**57.52**	**61.28**	**61.50**	**61.69**	**61.86**	**62.13**	**62.34**	**62.29**	**62.28**	**62.28**	**62.29**	**62.05**
1998	33.43	35.47	33.35	31.60	31.37	28.20	31.12	36.86	47.17	66.07	75.86	73.17	**80.16**	**67.61**	**61.94**	**56.87**	**53.98**	**55.07**	**58.76**	**58.91**	**59.04**	**59.15**	**59.34**	**59.54**	**59.57**	**59.62**	**59.66**	**59.68**	**59.52**	**59.30**
1999	40.44	32.20	30.40	30.06	27.33	30.52	35.62	43.85	60.02	72.75	68.08	**85.40**	**69.48**	**63.04**	**57.08**	**53.55**	**54.31**	**57.94**	**58.03**	**58.12**	**58.21**	**58.38**	**58.56**	**58.62**	**58.69**	**58.74**	**58.80**	**58.72**	**58.69**	**58.68**
2000	29.40	30.48	30.12	30.60	33.72	38.18	47.63	61.67	76.24	72.54	**83.98**	**73.14**	**66.26**	**59.51**	**55.71**	**55.40**	**58.69**	**58.77**	**59.01**	**59.23**	**59.55**	**59.81**	**59.97**	**60.14**	**60.29**	**60.42**	**60.38**	**60.40**	**60.45**	**60.43**
2001	26.83	30.25	30.96	35.33	38.47	46.51	59.31	70.96	69.74	**79.58**	**73.25**	**71.96**	**64.46**	**58.51**	**57.77**	**59.52**	**59.19**	**59.06**	**59.17**	**59.36**	**59.60**	**59.67**	**59.77**	**59.85**	**59.95**	**59.86**	**59.82**	**59.82**	**59.78**	**59.65**
2002	26.91	29.39	33.15	37.08	43.57	54.42	64.92	64.07	**79.09**	**68.14**	**68.45**	**66.07**	**59.45**	**57.57**	**59.13**	**57.75**	**57.62**	**57.63**	**57.78**	**57.95**	**58.03**	**58.08**	**58.19**	**58.27**	**58.20**	**58.21**	**58.26**	**58.30**	**58.34**	**58.42**
2003	29.56	28.18	30.28	39.87	50.87	59.11	59.27	**73.82**	**67.33**	**64.27**	**64.69**	**62.41**	**58.82**	**59.88**	**57.22**	**56.56**	**56.32**	**56.31**	**56.43**	**56.46**	**56.46**	**56.47**	**56.47**	**56.33**	**56.26**	**56.25**	**56.24**	**56.23**	**56.20**	**56.16**
2004	11.10	21.63	37.97	48.55	57.96	57.76	**72.78**	**66.53**	**63.64**	**59.97**	**62.64**	**61.85**	**61.93**	**59.04**	**56.95**	**56.26**	**55.91**	**55.86**	**55.78**	**55.80**	**55.86**	**55.89**	**55.78**	**55.74**	**55.76**	**55.76**	**55.76**	**55.75**	**55.75**	**55.81**
2005	13.12	37.58	47.41	57.23	57.29	**68.02**	**61.62**	**59.73**	**57.43**	**55.38**	**60.26**	**63.62**	**60.38**	**56.93**	**54.25**	**53.12**	**52.48**	**52.19**	**51.95**	**51.87**	**51.80**	**51.66**	**51.65**	**51.63**	**51.58**	**51.49**	**51.36**	**51.17**	**50.88**	**50.09**
2006	40.15	44.49	55.00	56.76	**66.98**	**58.85**	**56.85**	**55.03**	**54.47**	**56.49**	**64.26**	**65.37**	**62.30**	**59.37**	**56.31**	**54.60**	**53.23**	**52.40**	**51.75**	**51.34**	**50.84**	**50.65**	**50.57**	**50.60**	**50.59**	**50.58**	**50.56**	**50.57**	**50.56**	**50.49**
2007	35.90	51.72	55.13	**63.80**	**57.04**	**55.15**	**53.47**	**53.59**	**56.52**	**61.05**	**65.74**	**67.28**	**63.83**	**61.67**	**58.56**	**56.27**	**54.85**	**53.70**	**52.58**	**51.90**	**51.21**	**50.94**	**50.94**	**50.99**	**51.00**	**51.00**	**51.05**	**51.05**	**50.92**	**50.78**
2008	41.31	48.76	**59.10**	**53.32**	**52.37**	**50.72**	**50.62**	**54.32**	**59.93**	**60.89**	**65.28**	**66.89**	**63.93**	**61.07**	**57.79**	**55.10**	**53.23**	**52.31**	**51.37**	**51.15**	**51.03**	**51.02**	**51.03**	**50.99**	**50.93**	**50.87**	**50.76**	**50.62**	**50.44**	**50.22**
2009	34.51	**52.62**	**48.71**	**47.33**	**44.86**	**44.26**	**47.68**	**52.89**	**54.51**	**54.62**	**58.85**	**59.72**	**56.27**	**53.29**	**50.90**	**49.87**	**49.74**	**49.55**	**49.45**	**49.40**	**49.35**	**49.29**	**49.24**	**49.17**	**49.05**	**48.92**	**48.81**	**48.68**	**48.52**	**48.29**
2010	**42.79**	**40.79**	**40.88**	**38.49**	**37.54**	**40.16**	**44.82**	**45.31**	**46.27**	**46.59**	**49.91**	**52.37**	**49.30**	**47.86**	**47.80**	**47.89**	**47.81**	**47.80**	**47.82**	**47.82**	**47.81**	**47.79**	**47.75**	**47.69**	**47.61**	**47.54**	**47.46**	**47.37**	**47.28**	**47.17**
2011	**32.12**	**38.00**	**35.38**	**34.21**	**37.52**	**41.90**	**42.80**	**44.01**	**44.98**	**45.32**	**50.68**	**51.60**	**49.65**	**48.78**	**48.46**	**48.40**	**48.39**	**48.40**	**48.41**	**48.40**	**48.40**	**48.37**	**48.33**	**48.28**	**48.20**	**48.11**	**48.01**	**47.92**	**47.86**	**47.89**
2012	**32.42**	**32.44**	**31.92**	**34.93**	**40.15**	**41.50**	**42.60**	**44.17**	**45.92**	**46.76**	**51.34**	**54.11**	**52.33**	**51.57**	**51.51**	**52.00**	**52.46**	**52.90**	**53.27**	**53.61**	**53.89**	**54.13**	**54.32**	**54.52**	**54.68**	**54.74**	**54.73**	**54.64**	**54.50**	**54.26**
2013	**25.83**	**30.00**	**32.65**	**37.88**	**39.03**	**39.81**	**40.67**	**42.14**	**43.15**	**43.90**	**47.99**	**50.60**	**49.02**	**48.04**	**47.99**	**48.06**	**48.08**	**48.09**	**48.10**	**48.11**	**48.10**	**48.08**	**48.05**	**48.03**	**47.93**	**47.83**	**47.71**	**47.58**	**47.45**	**47.26**
2014	**25.55**	**32.27**	**36.08**	**37.92**	**39.40**	**40.10**	**41.45**	**42.89**	**43.33**	**44.63**	**48.74**	**51.23**	**49.48**	**48.84**	**48.87**	**48.96**	**49.04**	**49.10**	**49.14**	**49.16**	**49.18**	**49.18**	**49.15**	**49.11**	**49.05**	**48.97**	**48.86**	**48.73**	**48.58**	**48.35**
2015	**27.91**	**33.96**	**35.31**	**37.34**	**38.68**	**39.35**	**40.55**	**41.83**	**42.15**	**43.28**	**47.67**	**49.78**	**48.01**	**47.79**	**47.85**	**47.93**	**48.01**	**48.05**	**48.05**	**48.06**	**48.08**	**48.08**	**48.04**	**47.99**	**47.96**	**47.88**	**47.75**	**47.63**	**47.50**	**47.36**
2016	**28.77**	**33.99**	**35.23**	**37.39**	**39.37**	**39.73**	**41.23**	**42.47**	**42.73**	**43.77**	**48.00**	**49.87**	**48.06**	**47.85**	**47.93**	**48.04**	**48.12**	**48.19**	**48.25**	**48.31**	**48.36**	**48.37**	**48.37**	**48.35**	**48.31**	**48.27**	**48.21**	**48.13**	**48.05**	**47.94**
2017	**29.02**	**33.97**	**35.09**	**37.59**	**39.67**	**39.25**	**41.28**	**42.43**	**42.49**	**43.66**	**47.94**	**49.56**	**47.75**	**47.63**	**47.63**	**47.68**	**47.75**	**47.81**	**47.85**	**47.84**	**47.86**	**47.87**	**47.86**	**47.87**	**47.87**	**47.83**	**47.76**	**47.69**	**47.61**	**47.53**

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
1991	18.16	38.76	31.39	30.14	35.12	32.95	35.98	59.37	44.19	36.14	44.31	75.18	44.89	34.67	95.75	62.91	38.08	70.15	n/a	**75.83**	**69.41**	**64.48**	**59.41**	**57.14**	**58.25**	**61.98**	**62.05**	**62.11**	**62.17**	**62.38**
1992	19.43	33.60	31.60	34.80	35.56	39.85	42.86	43.94	48.92	34.44	38.13	50.26	48.51	48.98	61.89	43.05	97.31	96.22	**64.73**	**58.16**	**53.56**	**48.68**	**46.54**	**47.88**	**51.67**	**51.84**	**51.97**	**52.02**	**52.02**	**51.63**
1993	27.54	29.13	34.68	37.99	43.63	46.39	44.17	38.77	31.90	31.52	33.66	37.97	40.51	64.31	54.90	69.66	92.69	**70.18**	**62.93**	**56.92**	**51.95**	**49.32**	**50.28**	**53.86**	**53.84**	**54.01**	**54.64**	**54.87**	**55.13**	**55.18**
1994	23.84	29.97	35.74	42.04	45.75	41.90	36.84	30.52	28.78	27.41	28.58	37.38	41.04	72.42	77.39	68.53	**89.51**	**63.26**	**57.61**	**52.86**	**50.49**	**51.70**	**55.41**	**55.49**	**55.49**	**55.75**	**56.07**	**56.24**	**56.28**	**56.43**
1995	23.56	32.17	42.17	47.04	43.34	39.22	30.38	28.31	28.20	44.06	54.84	29.51	71.57	112.31	44.49	**73.28**	**64.01**	**56.71**	**50.76**	**47.73**	**48.41**	**51.48**	**51.57**	**51.77**	**52.01**	**52.40**	**52.99**	**53.30**	**53.54**	**53.76**
1996	24.70	38.72	39.48	37.53	33.63	27.92	29.45	25.74	27.62	33.34	52.49	66.98	69.05	93.43	**74.41**	**68.14**	**63.22**	**58.88**	**57.63**	**59.58**	**63.68**	**64.12**	**64.39**	**64.50**	**64.57**	**64.36**	**63.87**	**63.76**	**63.72**	**63.83**
1997	36.87	37.45	37.00	31.83	28.04	26.71	21.35	23.99	38.42	41.71	106.84	60.13	55.83	**88.67**	**78.49**	**69.19**	**63.05**	**60.47**	**61.50**	**65.39**	**65.78**	**66.11**	**66.32**	**66.58**	**66.50**	**65.94**	**65.81**	**65.88**	**65.86**	**65.13**
1998	37.23	31.47	25.60	23.34	22.98	22.60	27.35	30.46	46.92	58.17	61.39	56.42	**71.50**	**64.70**	**58.48**	**53.71**	**51.30**	**52.56**	**56.52**	**56.81**	**57.06**	**57.33**	**57.70**	**58.08**	**58.16**	**58.32**	**58.52**	**58.65**	**58.56**	**58.38**
1999	26.00	23.58	24.39	23.63	22.78	27.70	30.84	41.85	61.57	57.96	62.14	**69.68**	**64.09**	**58.41**	**53.45**	**50.47**	**51.61**	**55.32**	**55.69**	**55.98**	**56.15**	**56.39**	**56.52**	**56.53**	**56.55**	**56.58**	**56.59**	**56.50**	**56.57**	**56.84**
2000	15.64	24.81	24.56	26.96	28.63	29.34	36.63	40.32	82.94	79.82	**66.23**	**70.53**	**68.68**	**62.94**	**59.73**	**60.30**	**60.90**	**59.14**	**59.86**	**60.48**	**61.14**	**62.07**	**62.24**	**62.49**	**62.74**	**62.96**	**62.98**	**62.95**	**62.86**	**62.52**
2001	11.15	25.70	26.44	28.86	32.11	40.37	55.74	69.48	66.68	**65.44**	**64.45**	**64.14**	**56.08**	**51.78**	**50.02**	**52.93**	**52.96**	**53.22**	**53.60**	**53.91**	**54.04**	**53.97**	**53.96**	**53.93**	**53.88**	**53.68**	**53.57**	**53.53**	**53.48**	**53.42**
2002	20.84	25.10	28.58	31.45	36.85	51.26	62.32	62.80	**69.34**	**61.99**	**64.47**	**61.59**	**56.09**	**54.15**	**56.22**	**54.94**	**54.79**	**54.98**	**55.23**	**55.45**	**55.57**	**55.66**	**55.74**	**55.80**	**55.71**	**55.59**	**55.45**	**55.45**	**55.48**	**55.65**
2003	20.01	23.04	24.44	33.62	46.15	58.05	56.63	**68.24**	**60.92**	**58.10**	**58.07**	**56.17**	**53.54**	**55.11**	**54.21**	**53.99**	**53.95**	**54.02**	**54.21**	**54.31**	**54.34**	**54.30**	**54.33**	**54.20**	**54.13**	**53.97**	**53.96**	**53.96**	**53.89**	**53.75**
2004	9.66	18.94	35.36	46.22	56.65	59.06	**66.10**	**59.47**	**56.69**	**52.93**	**55.04**	**55.10**	**56.44**	**55.02**	**54.54**	**54.46**	**54.42**	**54.56**	**54.57**	**54.56**	**54.44**	**54.37**	**54.21**	**54.12**	**54.08**	**54.06**	**54.08**	**54.10**	**54.26**	**54.61**
2005	6.23	32.05	45.58	57.71	57.50	**63.62**	**56.98**	**55.43**	**52.83**	**50.51**	**55.74**	**60.17**	**57.25**	**55.72**	**54.57**	**54.37**	**54.77**	**54.91**	**55.22**	**55.42**	**55.59**	**55.55**	**55.55**	**55.58**	**55.57**	**55.44**	**55.17**	**55.15**	**55.15**	**54.75**
2006	31.42	40.65	57.40	56.63	**64.18**	**54.91**	**53.20**	**50.90**	**49.47**	**50.36**	**58.34**	**59.65**	**56.79**	**55.01**	**53.61**	**53.74**	**54.43**	**54.87**	**55.27**	**55.48**	**55.39**	**55.35**	**55.37**	**55.32**	**55.19**	**54.97**	**54.95**	**55.06**	**55.23**	**55.51**
2007	31.89	50.97	58.76	**58.15**	**51.03**	**49.50**	**47.66**	**47.16**	**50.14**	**54.65**	**59.70**	**62.35**	**60.41**	**59.42**	**58.68**	**57.26**	**56.29**	**54.64**	**53.42**	**52.78**	**52.37**	**52.26**	**52.38**	**52.43**	**52.46**	**52.60**	**52.90**	**52.87**	**52.83**	**52.93**
2008	36.98	50.62	**57.67**	**49.53**	**48.29**	**46.20**	**46.10**	**49.39**	**55.19**	**56.59**	**61.01**	**62.95**	**60.25**	**57.38**	**54.89**	**53.43**	**51.53**	**51.57**	**51.48**	**51.63**	**51.94**	**52.34**	**52.49**	**52.57**	**52.62**	**52.64**	**52.68**	**52.73**	**52.76**	**52.77**
2009	36.85	**51.01**	**41.94**	**41.07**	**39.34**	**39.36**	**42.74**	**48.32**	**50.35**	**51.34**	**55.06**	**57.99**	**55.16**	**52.01**	**49.61**	**47.66**	**46.81**	**46.54**	**46.56**	**46.65**	**46.74**	**46.78**	**46.83**	**46.84**	**46.84**	**46.85**	**46.89**	**46.92**	**46.95**	**46.94**
2010	**40.38**	**37.66**	**37.50**	**35.67**	**35.82**	**38.75**	**44.05**	**46.03**	**47.31**	**48.00**	**52.21**	**54.33**	**51.64**	**49.25**	**48.03**	**47.12**	**46.94**	**46.84**	**46.87**	**46.95**	**47.01**	**46.99**	**46.96**	**46.91**	**46.87**	**46.88**	**46.95**	**46.96**	**46.97**	**46.94**
2011	**30.07**	**34.22**	**31.97**	**32.19**	**35.54**	**40.71**	**42.38**	**44.08**	**45.37**	**46.42**	**51.98**	**53.04**	**50.87**	**49.84**	**49.77**	**49.79**	**49.50**	**49.59**	**49.62**	**49.67**	**49.71**	**49.75**	**49.75**	**49.74**	**49.73**	**49.79**	**49.84**	**49.91**	**50.04**	**50.39**
2012	**27.84**	**27.65**	**27.73**	**31.07**	**36.96**	**38.57**	**40.29**	**42.58**	**45.47**	**47.49**	**52.97**	**57.82**	**57.39**	**57.29**	**58.04**	**59.09**	**58.47**	**59.47**	**60.53**	**61.77**	**63.07**	**63.94**	**64.58**	**65.01**	**65.33**	**65.55**	**65.66**	**65.77**	**65.89**	**66.01**
2013	**21.22**	**24.84**	**28.04**	**33.64**	**35.24**	**36.68**	**38.43**	**41.19**	**43.44**	**45.76**	**51.29**	**56.24**	**57.09**	**58.30**	**59.18**	**60.01**	**59.13**	**58.55**	**57.48**	**57.21**	**56.74**	**56.91**	**57.06**	**57.17**	**57.25**	**57.31**	**57.31**	**57.33**	**57.34**	**57.29**
2014	**18.59**	**25.21**	**29.99**	**31.79**	**33.55**	**34.72**	**36.67**	**38.75**	**40.65**	**43.08**	**49.00**	**53.64**	**53.59**	**54.00**	**54.45**	**54.95**	**54.79**	**55.34**	**54.81**	**55.00**	**55.15**	**55.25**	**55.35**	**55.47**	**55.57**	**55.68**	**55.74**	**55.82**	**55.92**	**56.03**
2015	**22.54**	**28.19**	**30.28**	**32.28**	**33.93**	**35.30**	**37.47**	**39.16**	**41.20**	**43.15**	**48.29**	**52.65**	**52.35**	**52.50**	**52.56**	**53.08**	**53.41**	**53.63**	**53.80**	**53.92**	**53.51**	**53.38**	**53.16**	**52.97**	**52.82**	**52.71**	**52.74**	**52.78**	**52.86**	**53.06**
2016	**23.19**	**27.69**	**29.62**	**31.67**	**33.43**	**34.71**	**36.18**	**37.80**	**39.47**	**41.63**	**46.04**	**50.24**	**50.41**	**50.79**	**51.32**	**51.87**	**52.27**	**52.57**	**52.87**	**53.09**	**53.27**	**53.46**	**53.58**	**53.65**	**53.70**	**53.75**	**53.77**	**53.82**	**53.87**	**54.05**
2017	**22.73**	**27.08**	**29.22**	**31.44**	**32.86**	**33.92**	**35.54**	**36.71**	**38.69**	**40.72**	**44.99**	**49.53**	**49.54**	**49.56**	**50.08**	**50.51**	**50.09**	**50.30**	**50.53**	**50.75**	**51.03**	**51.22**	**51.33**	**51.47**	**51.56**	**51.57**	**51.59**	**51.65**	**51.69**	**51.67**

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
1996	55.94	30.90	38.77	46.18	47.23	48.88	51.81	42.72	22.74	78.63	98.26	160.08	258.69	-110.50	**101.00**
1997	n/a	31.02	36.79	47.47	41.07	33.44	47.07	58.39	56.01	75.65	105.49	349.22	67.27	**98.82**	**92.55**
1998	n/a	33.06	40.26	38.13	43.58	55.81	47.64	48.42	47.94	52.79	16.41	100.84	**103.34**	**91.28**	**85.25**
1999	31.77	34.50	41.84	36.78	41.39	48.79	54.73	71.28	84.70	94.62	103.73	**94.24**	**89.05**	**84.22**	**80.20**
2000	n/a	29.76	41.92	35.62	48.88	64.79	93.62	75.57	94.75	130.00	**100.17**	**95.19**	**89.50**	**84.83**	**82.45**
2001	67.53	37.55	41.01	44.73	45.98	62.55	87.72	68.32	62.12	**93.72**	**89.45**	**89.44**	**85.43**	**83.46**	**83.86**
2002	3.75	37.61	34.06	43.77	45.50	71.17	80.58	67.04	**92.60**	**78.18**	**81.33**	**81.07**	**78.84**	**80.09**	**84.31**
2003	73.57	31.61	37.07	53.29	51.03	57.63	64.89	**84.36**	**75.19**	**73.16**	**76.46**	**77.21**	**78.15**	**82.12**	**82.09**
2004	13.23	26.83	44.28	57.27	62.91	66.67	**82.28**	**73.28**	**71.48**	**70.50**	**76.32**	**79.80**	**83.57**	**83.52**	**83.52**
2005	37.29	39.61	45.49	54.52	54.37	**75.27**	**64.25**	**59.10**	**57.01**	**57.53**	**64.61**	**73.93**	**73.88**	**73.84**	**73.64**
2006	46.95	51.19	60.67	62.99	**79.49**	**69.99**	**64.79**	**58.97**	**57.12**	**60.71**	**71.72**	**76.19**	**76.25**	**76.20**	**76.31**
2007	48.29	52.65	59.01	**83.07**	**74.59**	**69.87**	**63.73**	**59.21**	**59.39**	**65.38**	**71.58**	**77.01**	**77.06**	**77.23**	**77.41**
2008	44.74	51.51	**80.20**	**73.55**	**69.37**	**63.64**	**58.47**	**57.19**	**60.90**	**64.25**	**70.44**	**76.16**	**76.23**	**76.37**	**76.43**
2009	44.03	**74.61**	**69.70**	**66.57**	**60.74**	**56.13**	**54.05**	**57.31**	**60.45**	**63.93**	**71.19**	**75.57**	**75.66**	**75.71**	**75.60**
2010	**67.01**	**64.71**	**61.57**	**56.84**	**51.22**	**49.33**	**52.68**	**55.44**	**59.68**	**63.55**	**71.08**	**75.90**	**76.03**	**76.14**	**76.21**
2011	**57.01**	**58.87**	**54.28**	**50.25**	**49.57**	**51.69**	**52.32**	**55.55**	**59.76**	**63.57**	**70.66**	**75.96**	**76.23**	**76.56**	**76.91**
2012	**57.07**	**56.27**	**54.93**	**54.77**	**57.41**	**56.09**	**57.19**	**60.51**	**64.89**	**68.56**	**76.26**	**81.22**	**81.76**	**82.31**	**82.62**
2013	**53.74**	**53.50**	**54.14**	**56.13**	**55.03**	**53.58**	**55.71**	**59.71**	**63.98**	**67.61**	**75.08**	**79.57**	**79.62**	**79.52**	**79.28**
2014	**46.15**	**51.17**	**54.76**	**52.96**	**51.64**	**50.01**	**52.10**	**55.73**	**60.16**	**64.01**	**71.37**	**76.15**	**76.23**	**76.37**	**76.54**
2015	**47.88**	**52.07**	**52.68**	**51.10**	**49.91**	**49.55**	**51.15**	**54.77**	**59.11**	**62.78**	**70.54**	**74.49**	**74.46**	**74.42**	**74.33**
2016	**55.28**	**61.40**	**62.57**	**61.49**	**59.91**	**59.26**	**58.71**	**61.44**	**65.71**	**69.52**	**76.16**	**81.64**	**81.70**	**81.78**	**81.93**
2017	**50.76**	**55.26**	**54.33**	**54.11**	**52.18**	**52.29**	**53.41**	**57.49**	**61.97**	**65.66**	**73.79**	**77.93**	**78.24**	**78.64**	**79.03**

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
1991	54.73	29.37	25.10	44.88	44.39	58.97	60.14	40.15	102.45	169.37	n/a	n/a	n/a	462.16	784.10
1992	n/a	28.69	20.57	32.88	12.80	34.35	75.48	54.35	77.53	114.56	181.35	193.84	n/a	n/a	n/a
1993	25.69	24.44	30.26	29.64	30.67	47.21	58.94	55.81	44.98	64.73	84.10	39.77	41.46	43.42	n/a
1994	29.81	19.49	24.30	34.68	48.17	50.73	56.00	50.46	60.53	36.32	72.10	118.62	173.01	295.84	173.23
1995	36.50	8.92	31.14	43.02	35.76	32.64	35.41	57.03	50.49	71.42	63.04	190.54	n/a	n/a	783.10
1996	n/a	48.45	53.01	37.85	56.30	34.40	42.55	29.33	69.24	120.23	102.60	191.02	n/a	772.30	**96.61**
1997	n/a	37.75	48.10	49.49	65.53	36.17	56.15	82.94	34.50	124.23	86.76	100.31	n/a	**101.09**	**94.43**
1998	0.00	23.15	28.97	32.88	46.16	42.20	33.15	37.96	164.79	138.56	237.44	82.36	**93.09**	**87.20**	**82.09**
1999	n/a	38.95	30.10	30.36	35.35	38.54	38.32	45.23	85.29	50.68	58.35	**93.21**	**87.51**	**82.63**	**78.60**
2000	n/a	11.17	42.03	33.50	34.83	60.74	86.34	83.60	64.56	71.13	**92.66**	**92.26**	**88.20**	**84.33**	**82.59**
2001	n/a	27.84	37.63	40.22	44.33	48.87	66.22	166.91	98.76	**92.24**	**79.90**	**81.95**	**77.20**	**74.82**	**75.86**
2002	n/a	27.32	31.06	39.52	46.16	57.39	69.56	68.68	**81.15**	**78.18**	**80.01**	**80.15**	**77.68**	**78.53**	**82.86**
2003	36.66	25.22	30.42	39.11	52.50	64.45	65.44	**76.16**	**73.08**	**71.51**	**74.58**	**76.08**	**77.03**	**81.11**	**81.37**
2004	12.44	29.94	35.07	55.49	64.76	62.45	**80.53**	**72.12**	**70.87**	**69.73**	**75.03**	**78.09**	**81.99**	**82.16**	**82.47**
2005	0.00	35.05	48.11	61.19	54.59	**78.63**	**67.75**	**65.78**	**64.64**	**65.30**	**74.05**	**81.31**	**81.26**	**81.06**	**80.46**
2006	n/a	42.04	56.01	55.89	**66.26**	**64.96**	**64.45**	**63.73**	**65.05**	**69.83**	**80.57**	**85.47**	**85.37**	**85.24**	**85.21**
2007	n/a	42.88	58.30	**66.91**	**65.38**	**62.57**	**61.54**	**61.95**	**66.21**	**73.85**	**81.63**	**87.30**	**87.81**	**88.46**	**89.15**
2008	n/a	41.35	**74.00**	**68.06**	**62.58**	**58.02**	**54.43**	**57.14**	**63.43**	**66.09**	**72.06**	**78.11**	**78.59**	**78.77**	**78.67**
2009	n/a	**66.46**	**62.24**	**58.74**	**53.27**	**49.14**	**49.49**	**55.02**	**58.60**	**62.43**	**68.56**	**75.14**	**75.30**	**75.39**	**75.59**
2010	**59.88**	**58.21**	**56.56**	**51.22**	**47.16**	**46.78**	**50.89**	**53.26**	**57.33**	**61.22**	**68.39**	**73.78**	**73.98**	**74.27**	**74.71**
2011	**52.76**	**56.08**	**52.47**	**49.14**	**48.83**	**51.37**	**51.78**	**54.06**	**57.58**	**61.42**	**68.23**	**73.92**	**74.18**	**74.45**	**74.74**
2012	**50.59**	**50.00**	**47.66**	**47.72**	**50.28**	**49.22**	**50.31**	**53.48**	**57.57**	**61.35**	**68.53**	**73.74**	**73.93**	**74.07**	**74.09**
2013	**44.87**	**46.64**	**47.81**	**49.92**	**48.56**	**48.07**	**49.98**	**53.36**	**57.53**	**61.45**	**67.99**	**73.61**	**73.84**	**73.95**	**74.13**
2014	**44.91**	**49.15**	**51.59**	**50.41**	**48.77**	**48.45**	**50.44**	**53.76**	**57.91**	**61.54**	**68.40**	**73.61**	**73.59**	**73.66**	**73.65**
2015	**46.80**	**51.52**	**51.52**	**50.12**	**49.26**	**48.78**	**50.59**	**54.27**	**58.34**	**61.91**	**69.03**	**74.07**	**74.22**	**74.38**	**74.47**
2016	**46.03**	**49.93**	**49.43**	**48.41**	**47.12**	**47.24**	**49.40**	**53.39**	**57.72**	**61.36**	**68.11**	**73.08**	**73.16**	**73.18**	**73.13**
2017	**44.38**	**48.12**	**48.09**	**47.31**	**46.46**	**46.83**	**49.14**	**53.06**	**57.45**	**61.28**	**68.33**	**73.80**	**73.97**	**74.22**	**74.62**

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
1990	n/a	26.51	35.11	45.32	40.62	28.25	36.64	57.91	55.38	37.30	40.76	44.48	46.13	64.95	11.34	131.52	39.49	n/a	21.14	n/a	**77.80**	**70.63**	**65.19**	**60.16**	**57.51**	**58.44**	**62.07**	**62.10**	**62.11**	**62.10**
1991	62.79	23.99	30.29	40.06	40.61	37.96	43.15	51.93	47.59	41.35	29.91	53.98	31.39	21.44	86.20	172.55	54.17	111.87	116.40	**75.77**	**69.56**	**64.08**	**59.23**	**56.68**	**57.62**	**61.34**	**61.48**	**61.61**	**61.69**	**61.84**
1992	22.82	31.97	32.85	34.95	35.45	42.79	46.43	44.31	40.79	37.09	24.19	30.88	30.39	23.64	37.81	108.27	93.57	87.62	**73.49**	**62.75**	**57.12**	**52.13**	**49.53**	**50.46**	**54.10**	**54.16**	**54.27**	**54.36**	**54.57**	**54.88**
1993	21.28	27.23	28.98	30.59	39.46	44.50	42.39	39.36	31.99	28.27	24.97	21.93	39.74	57.31	68.16	66.54	64.78	**74.41**	**63.19**	**57.83**	**53.05**	**50.57**	**51.61**	**55.33**	**55.46**	**55.64**	**55.77**	**55.99**	**56.26**	**56.43**
1994	11.37	24.87	27.96	34.71	39.33	36.56	31.98	28.11	25.71	25.16	23.31	39.31	33.83	56.67	94.99	58.62	**77.01**	**62.58**	**57.10**	**52.22**	**49.71**	**50.74**	**54.38**	**54.44**	**54.54**	**54.63**	**54.83**	**55.10**	**55.33**	**55.65**
1995	20.69	27.25	36.78	41.38	38.65	35.44	31.18	28.07	28.54	30.05	37.69	46.33	82.66	74.31	75.95	**74.07**	**63.34**	**57.95**	**53.28**	**50.94**	**52.16**	**56.00**	**56.15**	**56.29**	**56.41**	**56.63**	**56.89**	**57.07**	**57.24**	**57.37**
1996	26.88	40.16	37.74	35.43	33.70	31.12	28.56	23.71	28.49	35.06	45.53	65.61	79.10	67.33	**70.56**	**62.67**	**57.59**	**52.97**	**50.72**	**52.06**	**56.04**	**56.33**	**56.59**	**56.83**	**57.15**	**57.52**	**57.81**	**58.10**	**58.41**	**58.74**
1997	35.16	39.42	34.95	33.27	31.04	29.66	23.53	31.09	33.78	42.79	61.53	81.48	69.39	**78.42**	**64.64**	**59.15**	**54.40**	**51.94**	**53.11**	**56.98**	**57.22**	**57.45**	**57.67**	**57.99**	**58.37**	**58.67**	**58.99**	**59.30**	**59.60**	**59.76**
1998	37.76	33.99	30.13	29.47	28.90	25.31	29.62	33.32	46.43	58.66	71.23	73.15	**76.60**	**65.29**	**59.71**	**54.92**	**52.45**	**53.64**	**57.46**	**57.68**	**57.89**	**58.10**	**58.40**	**58.76**	**59.03**	**59.31**	**59.60**	**59.89**	**60.08**	**60.39**
1999	28.33	30.74	28.46	28.20	23.07	26.36	28.68	39.47	51.13	57.85	55.48	**79.87**	**65.22**	**57.29**	**51.03**	**48.33**	**49.28**	**53.03**	**53.27**	**53.53**	**53.76**	**54.07**	**54.45**	**54.74**	**55.04**	**55.33**	**55.63**	**55.79**	**56.00**	**56.24**
2000	23.92	29.47	27.96	28.39	27.89	32.64	35.71	50.27	63.60	58.00	**75.18**	**66.81**	**60.10**	**52.78**	**49.17**	**50.31**	**54.08**	**54.30**	**54.49**	**54.70**	**55.02**	**55.39**	**55.69**	**55.99**	**56.31**	**56.63**	**56.84**	**57.11**	**57.43**	**57.79**
2001	25.02	28.18	29.64	28.37	29.72	42.14	58.60	63.70	68.91	**76.93**	**68.07**	**65.40**	**57.04**	**51.71**	**50.42**	**53.95**	**54.01**	**54.19**	**54.31**	**54.59**	**54.92**	**55.15**	**55.39**	**55.62**	**55.85**	**55.93**	**56.07**	**56.23**	**56.36**	**56.39**
2002	17.50	26.78	26.55	27.63	37.89	45.05	61.03	59.86	**72.93**	**65.09**	**64.69**	**61.60**	**55.16**	**52.79**	**54.24**	**54.09**	**54.29**	**54.55**	**54.92**	**55.36**	**55.72**	**56.09**	**56.47**	**56.85**	**57.11**	**57.42**	**57.78**	**58.13**	**58.48**	**58.84**
2003	12.63	23.27	26.33	35.22	46.41	55.82	56.94	**74.27**	**67.06**	**62.27**	**63.43**	**58.99**	**56.87**	**56.89**	**55.59**	**55.35**	**55.39**	**55.63**	**56.00**	**56.30**	**56.62**	**56.94**	**57.26**	**57.46**	**57.72**	**58.03**	**58.33**	**58.63**	**58.93**	**59.29**
2004	9.91	20.35	34.69	46.43	57.33	58.58	**73.35**	**66.35**	**63.17**	**58.53**	**60.39**	**59.36**	**59.79**	**56.37**	**54.93**	**54.64**	**54.71**	**54.89**	**55.15**	**55.42**	**55.70**	**55.97**	**56.11**	**56.30**	**56.52**	**56.73**	**56.93**	**57.10**	**57.25**	**57.32**
2005	24.93	35.18	48.03	56.21	56.58	**67.66**	**61.11**	**58.51**	**55.61**	**53.28**	**58.71**	**61.15**	**58.17**	**54.62**	**52.43**	**51.63**	**51.05**	**50.60**	**50.28**	**50.25**	**50.40**	**50.52**	**50.75**	**51.00**	**51.23**	**51.43**	**51.61**	**51.75**	**51.83**	**51.67**
2006	39.01	45.87	58.00	59.54	**64.10**	**57.08**	**54.88**	**52.79**	**52.19**	**53.62**	**61.73**	**62.56**	**59.61**	**56.10**	**53.85**	**52.61**	**51.22**	**50.65**	**50.06**	**49.93**	**49.64**	**49.67**	**49.85**	**50.15**	**50.39**	**50.60**	**50.79**	**50.98**	**51.15**	**51.30**
2007	20.85	51.11	55.63	**61.58**	**53.76**	**51.66**	**49.78**	**49.42**	**52.43**	**57.18**	**61.99**	**63.49**	**61.19**	**58.84**	**56.85**	**55.27**	**53.42**	**52.52**	**51.18**	**50.72**	**49.49**	**49.69**	**49.96**	**50.25**	**50.61**	**50.96**	**51.26**	**51.56**	**51.87**	**52.24**
2008	12.12	40.68	**54.79**	**48.44**	**46.75**	**44.71**	**44.51**	**48.20**	**53.51**	**55.35**	**57.79**	**61.35**	**58.83**	**55.26**	**52.88**	**50.29**	**49.35**	**48.67**	**48.48**	**48.65**	**48.97**	**49.48**	**49.90**	**50.30**	**50.68**	**51.03**	**51.35**	**51.64**	**51.85**	**51.86**
2009	30.84	**50.36**	**45.58**	**43.69**	**41.14**	**40.22**	**43.07**	**47.99**	**50.00**	**49.46**	**54.41**	**55.63**	**52.09**	**49.89**	**47.75**	**47.76**	**48.00**	**48.25**	**48.61**	**49.00**	**49.38**	**49.74**	**50.07**	**50.38**	**50.66**	**50.92**	**51.15**	**51.34**	**51.48**	**51.43**
2010	**37.87**	**37.06**	**37.15**	**34.83**	**34.02**	**36.36**	**40.83**	**42.16**	**42.99**	**43.37**	**48.26**	**49.28**	**46.50**	**45.04**	**45.13**	**45.49**	**45.72**	**46.00**	**46.34**	**46.65**	**46.96**	**47.27**	**47.58**	**47.86**	**48.14**	**48.40**	**48.65**	**48.89**	**49.09**	**49.22**
2011	**31.53**	**36.78**	**33.80**	**32.82**	**35.95**	**39.91**	**41.12**	**42.88**	**43.10**	**44.14**	**50.67**	**51.01**	**49.67**	**49.97**	**50.65**	**51.26**	**51.15**	**51.76**	**52.17**	**52.37**	**52.81**	**53.24**	**53.71**	**54.03**	**54.38**	**54.70**	**54.99**	**55.20**	**55.42**	**55.33**
2012	**31.33**	**31.12**	**30.32**	**33.58**	**38.40**	**39.23**	**40.74**	**42.73**	**43.10**	**45.36**	**52.96**	**53.01**	**51.49**	**51.46**	**51.90**	**52.13**	**52.54**	**53.04**	**53.54**	**54.03**	**54.50**	**54.90**	**55.34**	**55.71**	**56.06**	**56.39**	**56.90**	**56.93**	**57.20**	**57.42**
2013	**25.76**	**29.97**	**32.83**	**38.63**	**39.69**	**39.66**	**42.39**	**43.31**	**43.42**	**45.84**	**51.70**	**51.22**	**50.88**	**50.81**	**51.16**	**51.74**	**52.21**	**52.67**	**53.11**	**53.54**	**53.91**	**54.29**	**54.63**	**54.94**	**55.23**	**55.64**	**55.75**	**56.02**	**56.29**	**56.59**
2014	**24.27**	**30.92**	**35.61**	**37.63**	**38.82**	**39.25**	**40.97**	**42.12**	**43.23**	**44.53**	**50.51**	**51.57**	**50.38**	**50.54**	**50.84**	**51.18**	**51.51**	**51.83**	**52.12**	**52.44**	**52.66**	**52.89**	**53.12**	**53.34**	**53.45**	**53.77**	**54.00**	**54.27**	**54.63**	**55.39**
2015	**24.24**	**31.23**	**33.15**	**35.47**	**37.00**	**37.59**	**39.25**	**40.86**	**42.02**	**44.24**	**49.83**	**49.87**	**49.06**	**49.42**	**49.92**	**50.43**	**50.95**	**51.42**	**51.80**	**52.26**	**52.69**	**53.05**	**53.36**	**54.05**	**54.14**	**54.47**	**54.78**	**55.06**	**55.27**	**55.32**
2016	**27.61**	**31.95**	**33.41**	**35.49**	**37.39**	**37.53**	**39.31**	**40.99**	**41.07**	**42.27**	**47.97**	**49.11**	**47.22**	**47.57**	**47.53**	**47.77**	**48.01**	**48.21**	**48.42**	**48.60**	**48.77**	**48.93**	**49.17**	**49.23**	**49.38**	**49.50**	**49.61**	**49.67**	**49.64**	**49.26**
2017	**30.60**	**34.62**	**35.49**	**38.16**	**39.29**	**39.11**	**42.60**	**43.84**	**42.97**	**45.46**	**51.48**	**51.40**	**51.01**	**51.36**	**51.67**	**52.08**	**52.34**	**52.74**	**53.10**	**53.44**	**53.76**	**54.12**	**54.36**	**54.66**	**54.95**	**55.20**	**55.42**	**55.57**	**55.58**	**55.08**

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
1993	12.56	30.73	41.36	38.25	44.23	47.85	40.05	42.88	21.70	41.17	28.74	33.30	148.90	n/a	68.31	n/a	107.67	**71.22**	**63.43**	**57.38**	**52.14**	**49.21**	**49.83**	**53.63**	**53.72**	**53.94**	**54.29**	**54.78**	**55.47**	**56.20**
1994	37.43	36.77	39.01	44.56	47.91	43.43	37.96	28.01	21.12	17.88	67.61	61.60	102.64	n/a	97.99	16.73	**82.72**	**64.38**	**58.57**	**53.59**	**50.91**	**51.70**	**55.61**	**55.83**	**56.16**	**56.61**	**57.20**	**57.97**	**58.68**	**59.53**
1995	45.94	35.77	40.58	45.92	40.06	42.36	21.91	12.76	6.44	8.19	0.00	4.24	88.52	140.07	0.00	**76.25**	**68.58**	**62.66**	**57.35**	**54.46**	**54.92**	**58.10**	**57.49**	**57.08**	**56.90**	**56.95**	**57.20**	**57.39**	**57.64**	**57.99**
1996	0.31	33.76	38.00	35.37	26.78	23.96	19.01	29.45	49.97	14.45	14.55	58.81	43.79	184.35	**75.96**	**70.24**	**64.74**	**60.17**	**58.20**	**59.80**	**64.48**	**65.29**	**65.95**	**66.65**	**66.72**	**62.94**	**55.50**	**52.89**	**55.68**	**59.09**
1997	37.19	39.51	32.44	32.02	26.15	18.63	24.94	20.27	25.19	46.29	45.31	51.39	51.06	**70.18**	**63.71**	**58.27**	**53.52**	**51.31**	**52.68**	**57.16**	**57.92**	**58.78**	**59.77**	**60.84**	**62.05**	**63.11**	**64.14**	**65.13**	**66.10**	**66.99**
1998	31.55	28.93	27.27	23.89	18.46	19.52	21.73	27.92	23.32	24.33	46.61	-35.01	**68.94**	**62.30**	**57.72**	**53.47**	**51.60**	**53.19**	**57.64**	**58.30**	**58.96**	**59.60**	**60.23**	**60.87**	**61.32**	**61.72**	**62.05**	**62.33**	**62.40**	**62.30**
1999	n/a	21.90	25.09	19.30	19.28	34.87	29.93	37.38	76.72	87.67	48.32	**65.39**	**58.82**	**53.76**	**49.38**	**47.30**	**48.68**	**53.30**	**54.19**	**55.15**	**56.22**	**57.40**	**58.76**	**60.03**	**61.32**	**62.58**	**63.80**	**64.83**	**65.76**	**66.65**
2000	13.98	29.86	24.22	24.81	31.51	24.75	29.18	57.83	60.25	31.59	**87.67**	**66.36**	**60.12**	**54.78**	**51.57**	**52.26**	**55.93**	**56.41**	**56.89**	**57.39**	**57.94**	**58.55**	**59.02**	**59.49**	**59.95**	**60.39**	**60.70**	**61.09**	**61.54**	**62.10**
2001	17.29	29.93	32.30	33.50	27.38	43.71	54.99	71.56	65.68	**69.25**	**61.39**	**60.55**	**54.23**	**49.19**	**50.08**	**54.68**	**55.63**	**56.48**	**57.39**	**58.35**	**59.41**	**60.34**	**61.24**	**62.10**	**62.90**	**63.50**	**64.13**	**64.74**	**65.24**	**65.44**
2002	13.13	24.68	26.30	28.82	36.32	48.68	64.59	60.99	**71.67**	**60.85**	**59.37**	**57.24**	**51.74**	**50.24**	**53.64**	**53.85**	**54.31**	**54.83**	**55.45**	**56.21**	**56.91**	**57.65**	**58.46**	**59.31**	**60.09**	**60.96**	**61.91**	**62.85**	**63.76**	**64.49**
2003	20.50	24.19	26.74	31.90	44.89	54.23	58.91	**70.36**	**62.40**	**57.89**	**57.52**	**55.10**	**53.25**	**54.82**	**54.28**	**54.31**	**54.61**	**55.21**	**55.93**	**56.60**	**57.33**	**58.12**	**58.96**	**59.73**	**60.57**	**61.50**	**62.43**	**63.36**	**64.25**	**64.94**
2004	13.41	21.97	34.11	47.88	55.10	58.09	**69.30**	**61.56**	**58.47**	**54.08**	**56.18**	**55.89**	**57.43**	**55.28**	**54.96**	**55.19**	**55.53**	**56.15**	**56.71**	**57.38**	**58.00**	**58.65**	**59.18**	**59.79**	**60.45**	**61.12**	**61.77**	**62.41**	**63.02**	**63.46**
2005	23.96	32.71	47.79	58.58	57.52	**66.24**	**58.41**	**55.38**	**51.73**	**49.54**	**54.18**	**58.34**	**55.81**	**54.60**	**53.44**	**53.64**	**54.01**	**53.62**	**53.69**	**53.74**	**54.72**	**55.27**	**55.89**	**56.54**	**57.19**	**57.83**	**58.44**	**59.00**	**59.43**	**59.28**
2006	19.82	41.21	51.06	54.68	**65.98**	**53.83**	**51.21**	**47.67**	**46.22**	**46.70**	**55.70**	**56.05**	**52.83**	**50.98**	**49.51**	**48.12**	**48.02**	**46.99**	**47.93**	**48.61**	**49.11**	**49.64**	**50.19**	**50.71**	**51.21**	**51.70**	**52.21**	**52.78**	**53.53**	**54.95**
2007	n/a	56.28	70.03	**64.04**	**53.68**	**51.58**	**49.20**	**48.53**	**50.08**	**54.99**	**57.35**	**61.37**	**57.35**	**56.59**	**55.88**	**55.59**	**54.44**	**54.76**	**53.90**	**55.86**	**56.68**	**57.48**	**58.23**	**58.93**	**59.57**	**60.17**	**60.74**	**61.29**	**61.86**	**62.60**
2008	n/a	42.58	**51.48**	**49.45**	**48.26**	**46.89**	**46.45**	**49.55**	**54.38**	**56.38**	**57.56**	**62.20**	**59.76**	**57.29**	**56.22**	**54.73**	**53.98**	**53.81**	**52.85**	**52.36**	**52.61**	**51.01**	**51.51**	**52.18**	**52.84**	**53.34**	**53.80**	**54.24**	**54.67**	**55.12**
2009	43.03	**47.45**	**44.48**	**43.50**	**42.00**	**42.12**	**45.33**	**51.48**	**53.44**	**55.34**	**57.23**	**63.42**	**60.36**	**57.45**	**55.06**	**52.52**	**51.25**	**49.89**	**49.56**	**49.71**	**50.65**	**51.89**	**52.92**	**53.93**	**54.95**	**55.95**	**56.92**	**57.83**	**58.61**	**59.09**
2010	**40.54**	**39.84**	**39.80**	**38.31**	**38.54**	**41.52**	**47.61**	**49.36**	**51.49**	**51.78**	**57.44**	**57.87**	**54.61**	**51.71**	**49.85**	**48.19**	**48.01**	**48.50**	**49.09**	**49.79**	**50.66**	**51.59**	**52.53**	**53.49**	**54.48**	**55.48**	**56.47**	**57.42**	**58.31**	**59.02**
2011	**30.74**	**35.12**	**33.62**	**33.88**	**37.06**	**42.57**	**44.09**	**45.66**	**46.93**	**47.48**	**53.28**	**54.07**	**51.44**	**50.27**	**49.92**	**49.53**	**49.86**	**49.53**	**49.90**	**50.37**	**50.95**	**51.47**	**52.08**	**52.65**	**53.56**	**54.20**	**54.84**	**55.51**	**56.25**	**57.18**
2012	**29.11**	**29.75**	**30.26**	**33.42**	**39.16**	**39.89**	**41.52**	**42.81**	**44.15**	**45.65**	**51.50**	**52.50**	**51.34**	**50.60**	**50.48**	**50.45**	**50.93**	**51.41**	**52.02**	**52.67**	**53.32**	**53.99**	**54.60**	**55.22**	**55.85**	**56.48**	**57.09**	**57.76**	**58.44**	**58.98**
2013	**23.48**	**26.71**	**30.24**	**35.99**	**37.17**	**38.33**	**40.27**	**41.94**	**43.65**	**45.63**	**51.49**	**53.32**	**52.95**	**53.09**	**53.29**	**53.55**	**53.55**	**54.06**	**54.03**	**54.60**	**54.96**	**55.42**	**55.96**	**56.46**	**57.01**	**57.60**	**58.28**	**59.05**	**59.93**	**61.12**
2014	**20.92**	**26.80**	**32.70**	**34.00**	**35.16**	**36.42**	**37.98**	**39.02**	**40.87**	**42.64**	**47.37**	**49.82**	**49.31**	**49.21**	**49.69**	**50.24**	**50.79**	**51.29**	**51.80**	**52.28**	**52.79**	**53.28**	**53.65**	**54.05**	**54.51**	**55.03**	**55.58**	**56.14**	**56.69**	**57.22**
2015	**22.85**	**29.73**	**31.82**	**33.60**	**35.28**	**36.58**	**38.36**	**39.81**	**41.41**	**42.89**	**48.33**	**50.63**	**50.16**	**50.65**	**51.31**	**52.03**	**52.80**	**53.58**	**54.43**	**55.18**	**56.08**	**57.00**	**57.96**	**59.00**	**60.20**	**61.47**	**62.72**	**63.86**	**64.67**	**64.23**
2016	**24.43**	**29.23**	**31.42**	**33.17**	**34.82**	**36.35**	**37.59**	**38.99**	**41.12**	**42.17**	**47.64**	**50.26**	**49.83**	**50.26**	**50.88**	**51.67**	**52.44**	**53.34**	**54.13**	**55.03**	**55.99**	**57.02**	**58.14**	**59.37**	**60.74**	**62.09**	**63.42**	**64.64**	**65.54**	**65.34**
2017	**25.11**	**30.15**	**32.59**	**34.53**	**35.93**	**37.16**	**39.12**	**40.09**	**41.57**	**43.60**	**48.26**	**50.34**	**50.10**	**50.38**	**50.80**	**51.22**	**51.63**	**52.02**	**52.38**	**52.65**	**52.97**	**53.27**	**53.57**	**53.71**	**53.96**	**54.19**	**54.41**	**54.59**	**54.70**	**54.61**

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