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November 12, 2020

The Honorable Dana T. Wade
Assistant Secretary for Housing and Federal Housing Commissioner
U.S. Department of Housing and Urban Development
451 Seventh Street, S.W., Room 9100
Washington, D.C. 20410

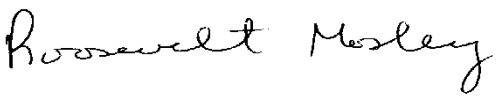
Dear Commissioner Wade:

Pinnacle Actuarial Resources, Inc. (Pinnacle) has completed the final report for the Fiscal Year 2020 Independent Actuarial Review of the Mutual Mortgage Insurance Fund Forward Loans. The attached report details our estimate of the Cash Flow Net Present Value for Fiscal Year 2020 as of September 30, 2020.

Roosevelt C. Mosley, Jr., FCAS, MAAA is responsible for the content and conclusions set forth in the report. I am a Fellow of the Casualty Actuarial Society and a member of the American Academy of Actuaries, and am qualified to render the actuarial opinion contained herein.

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

Respectfully Submitted,



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

Fiscal Year 2020 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Economic Net Worth of Forward Mortgage Insurance-In-Force

Final Report Based on Data as of September 30, 2020

November 12, 2020

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Summary of Findings

This report presents the results of Pinnacle Actuarial Resources, Inc.'s (Pinnacle's) independent actuarial review of the Economic Value associated with forward mortgages insured by the Mutual Mortgage Insurance Fund (MMI or Fund) for Fiscal Year 2020. The Economic Value associated with Home Equity Conversion Mortgages (HECMs) are analyzed separately and are excluded from this report. In the remainder of this report, the term MMI refers to forward mortgages and excludes HECMs.

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

Deliverable 1: Produce a written Actuarial Study for Forward that provides actuarial central estimates of MMI Economic Net Worth as of the end of Fiscal Year 2020 and assesses HUD's estimates of Economic Net Worth.

The Economic Net Worth is defined as cash available to the Fund plus the Net Present Value (NPV) of all future cash outflows and inflows that are expected to result from the mortgages currently insured by the MMI.

As of the end of Fiscal Year 2020, Pinnacle's Actuarial Central Estimate (ACE) of the MMI Forward Cash Flow NPV is $23.397 billion.

The total capital resource as reported in the Annual Report to Congress Regarding the Status of the FHA Mutual Mortgage Insurance Fund is $67.368 billion at the end of Fiscal Year 2020. Thus, the ACE of the Economic Net Worth of the MMI is $90.765 billion.

Deliverable 2: Include a review of the risk characteristics of existing MMI loans including commentary on how such characteristics have changed in recent years.

A review of the risk characteristics of existing MMI loans, and a commentary on how these risk characteristics have changed is included in Section 4.

Deliverable 3: Apply the final Forward actuarial model to the existing portfolio to produce conditional (and cumulative) claim, prepayment, and loss-given-default rates at various levels of aggregation across loans, and for individual policy years and policy year-quarter. Cash-flow summaries should also be provided for major categories (e.g., premium revenues, claim expenses and recoveries or net loss due to claim, with affected loan counts and balances).

Appendix G shows the interim and final claim rates, non-claim termination rates and loss severities by cohort. Each of these elements is calculated for each year of developed experience, and final projections are also included. Cash flow summaries by major category and credit subsidy cohort are shown below and discussed in more detail in Sections 2 and 3.

Table 1: Projected Cash Flow Summaries

Cash Flow Category	Net Present Value of Cash Flow
Mortgage Insurance Premium	55,147,709,341
Loss Incurred	23,961,917,445
Loss Mitigation Expense	869,291,003
HAMP Expense	20,106,614,457
HAMP Recovery	13,186,796,336

Deliverable 4: To promote transparency of the Studies' assessments, the Studies should identify methodological vulnerabilities that may occur in its actuarial models or in HUD's analyses of Economic Net Worth. This discussion should evaluate the scope and scale of such vulnerabilities in creating possible forecast risk and suggest possible lines of research in these areas. The Studies should assess and comment upon HUD's own models that estimate Economic Net Worth for methodological vulnerabilities and compare HUD's methodologies with those in the Studies.

The assumptions and judgments on which the Cash Flow NPV estimates are based are summarized in Section 5 of this report. Appendix B shows the specifications and assumptions related to the transition models. Appendix C details the loss severity models. Section 3 describes the economic assumptions incorporated into the Cash Flow NPV estimates and the sensitivity of the estimates to alternative economic scenarios. Lastly, Section 5 and Appendix E summarize the assumptions associated with the cash flow analysis.

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

Appendix F provides a discussion of the HUD methodologies for estimating Economic Net Worth, a comparison of HUD modeling methodology to those used in this study, and methodological vulnerabilities of the HUD models.

Deliverable 5: The Studies should include historical data on changes in program terms as well as relevant loan and borrower characteristics (e.g., credit scores, loan-to-value ratios) by cohort and other sub-populations. Loan performance data (claim rates, prepayment rates, severity and recovery rates) both historical and projected should be presented in the "finger-table" formats (arrayed by cohort and policy years for different loan products).

A review of the risk characteristics of existing MMI loans, and a commentary of how these risk characteristics have changed is included in Section 4. Appendix G shows the interim and final claim rates, non-claim termination rates and loss severities by cohort. Each of these elements is calculated for each year of developed experience, and final projections are also included.

Deliverable 6: The Contractor should use the President's Economic Assumptions (provided by ORMRA) for the actuarial central estimates of the Studies. However, in addition to the central single path economic forecast,

the Studies should test alternative economic forecasts for stress-testing and sensitivity analysis to estimate ranges of reasonableness.

Pinnacle's ACE of Cash Flow NPV is based on the Economic Assumption for the 2021 Budget from the Office of Management and Budget (OMB Economic Assumptions). Pinnacle also estimated Cash Flow NPV outcomes based on economic scenarios from Moody's Analytics (Moody's). The Cash Flow NPV results based on these scenarios are shown in Table 2.

Table 2: Range of Cash Flow NPV Outcomes Based on OMB & Moody's Scenarios

Economic Scenario	Fiscal Year 2020 Cash Flow NPV
Pinnacle ACE	23,396,682,771
Baseline	5,109,328,875
Alternative 0 – Upside (4th Percentile)	19,905,923,534
Alternative 1 – Upside (10th Percentile)	12,935,115,293
Alternative 2 – Downside (75th Percentil	(369,228,238)
Alternative 3 – Downside (90th Percentil	(8,607,939,515)
Alternative 4 – Downside (96th Percentil	(18,993,162,441)
Slower-Trend Growth	(1,564,277,946)
Stagflation	(1,263,561,223)
Next-Cycle Recession	965,577,777
Low Oil Price	2,470,564,208

The range of results based on the Moody's estimates is negative $18.993 billion to positive $19.906 billion.

In addition, Pinnacle has estimated a range of outcomes based on 100 randomly generated stochastic simulations of key economic variables. Based on these simulations, the range of Cash Flow NPV estimates is negative $21.162 billion to positive $26.989 billion.

The Cash Flow NPV estimate provided by the Federal Housing Administration (FHA) to be used in the FHA's Annual Report to Congress is positive $10.4 billion. Based on Pinnacle's Actuarial Central Estimate and range of reasonable estimates, we conclude that the FHA estimate of Cash Flow NPV to be used in the FHA's Annual Report to Congress is reasonable.

Pinnacle's Cash Flow NPV by cohort is shown below for the largest negative outcome and the largest positive outcome based on the stochastic simulation results.

Table 3: Range of Cash Flow NPV Estimates - Forward Portfolio

Cohort	Largest Negative	Largest Positive	Pinnacle ACE
1992	-582,799	-499,011	-348,460
1993	-1,732,222	-2,025,224	-1,160,429
1994	-2,803,568	-2,868,117	-1,915,290
1995	-3,336,264	-1,550,995	-1,435,867
1996	-7,546,770	-3,901,140	-3,362,930
1997	-11,621,631	-5,949,803	-6,759,911
1998	-24,000,445	-13,200,889	-10,775,983
1999	-36,526,680	-13,851,925	-14,869,717
2000	-28,565,433	-10,771,444	-13,245,634
2001	-78,849,753	-50,858,671	-46,115,845
2002	-119,825,815	-67,799,028	-69,343,144
2003	-184,894,858	-110,274,953	-106,768,867
2004	-282,073,988	-149,998,354	-163,750,202
2005	-278,974,908	-178,908,301	-156,305,021
2006	-320,695,118	-189,452,807	-173,081,954
2007	-441,340,874	-279,523,086	-255,907,972
2008	-1,182,233,082	-670,053,225	-669,157,326
2009	-1,559,866,282	-872,430,805	-918,788,943
2010	-1,384,465,022	-737,323,753	-776,487,875
2011	-930,707,047	-451,196,593	-503,559,927
2012	-1,204,986,075	-428,503,213	-447,634,443
2013	-1,857,645,251	-322,744,020	-387,410,293
2014	393,118,924	1,870,461,330	1,831,341,873
2015	-89,708,553	3,276,025,896	3,463,919,332
2016	-1,087,884,321	4,350,067,169	4,365,037,310
2017	-2,492,623,609	4,681,571,413	4,000,572,745
2018	-3,842,675,881	2,561,169,930	1,533,469,469
2019	-4,064,463,252	2,624,591,563	2,041,597,422
2020	-34,268,421	12,189,020,226	10,888,930,652
Total	-21,161,778,996	26,989,222,172	23,396,682,771

Deliverable 7: To provide comparability to HUD estimates of Economic Net Worth, the Contractor shall use Federal Credit Reform Act discounting assumptions and procedures.

Pinnacle has developed estimates of Economic Net Worth using the Federal Credit Reform Act discounting assumptions.

Deliverable 8: These Studies should use stochastic or Monte Carlo simulations of future economic conditions including for interest rates and house price appreciation. The objective of these requirements is to illustrate the sensitivity of forecasts to economic uncertainty and other forms of forecast error.

As described in the results for Deliverable 6, additional economic assumptions were generated using Monte Carlo simulations and Moody's economic scenarios. These results are discussed in further detail in Section 3.

Deliverable 9: Provide econometric appendices to the Studies that include variable specifications and statistical output from all regressions in the Studies. Individual estimation equations may not be combined for reporting.

Appendix B shows the predictive model parameters and goodness of fit measures for the Transition models. Appendix C shows the parameters and goodness of fit measures for the Loss Severity models. See the Binomial Model Results and Model Validation sections in Appendix B and the Model Parameters and Model Validation sections in Appendix C.

Executive Summary

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

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

The primary purpose of this actuarial analysis is to estimate the Economic Net Worth of the current book of business. The Economic Net Worth is defined as cash available to the Fund plus the NPV of all future cash outflows and inflows that are expected to result from the mortgages currently insured by the MMI.

We have calculated a range of estimates using economic projections from the OMB Economic Assumptions for Fiscal Year 2020, ten economic projection scenarios from Moody's and a stochastic simulation approach to test variation from the base economic scenario.

Based on our analysis, we estimate that the Cash Flow NPV as of the end of Fiscal Year 2020 is $23.397 billion. We also estimate that the range of Cash Flow NPV based on randomly generated economic scenarios is between negative $21.162 billion and positive $26.989 billion.

The total capital resource as reported in the Annual Report to Congress Regarding the Status of the FHA Mutual Mortgage Insurance Fund is $67.368 billion at the end of Fiscal Year 2020. Thus, the estimated Economic Net Worth of the MMI is $90.765 billion.

Impact of Economic Forecasts

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

- 30-year fixed-rate home mortgage effective rates
- 10-year Constant Maturity Treasury (CMT) rates
- Three-year CMT rates
- One-year CMT rates
- Housing price index (HPI)
- Unemployment rates

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

We have also estimated the Cash Flow NPV of the MMI under ten economic scenarios from Moody's. These scenarios are:

1. Baseline
2. Alternative 0 – Upside (4th Percentile)
3. Alternative 1 – Upside (10th Percentile)
4. Alternative 2 – Downside (75th Percentile)
5. Alternative 3 – Downside (90th Percentile)
6. Alternative 4 – Downside (96th Percentile)
7. Slower Trend Growth
8. Stagflation
9. Next-Cycle Recession
10. Low Oil Price

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

The summary of the estimated Cash Flow NPV resulting from each scenario is shown in Table 4.

Table 4: Projected Forward Cash Flow NPV Using Alternative Economic Scenarios

Economic Scenario	Fiscal Year 2020 Cash Flow NPV
Pinnacle ACE	23,396,682,771
Baseline	5,109,328,875
Alternative 0 – Upside (4th Percentile)	19,905,923,534
Alternative 1 – Upside (10th Percentile)	12,935,115,293
Alternative 2 – Downside (75th Percentil	(369,228,238)
Alternative 3 – Downside (90th Percentil	(8,607,939,515)
Alternative 4 – Downside (96th Percentil	(18,993,162,441)
Slower-Trend Growth	(1,564,277,946)
Stagflation	(1,263,561,223)
Next-Cycle Recession	965,577,777
Low Oil Price	2,470,564,208

We also randomly generated 100 stochastic simulations of key economic variables. Based on these simulations, the range of Cash Flow NPV estimates is negative $21.162 billion to positive $26.989 billion.

Distribution and Use

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

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

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

Reliances and Limitations

Listed in Section 5 are the data sources Pinnacle has relied upon in our analysis. We have relied on the accuracy of these data sources in our calculations. If it is subsequently discovered that the underlying data or information is erroneous, then our calculations would need to be revised accordingly.

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

A substantial source of uncertainty relates to the emergence of the COVID-19 pandemic in 2020. This uncertainty could impact the projection of Cash Flow NPV in several different ways including distortion of historical patterns as the MMI handles claims differently and sudden changes in loan origination exposure as the peril continues to emerge. Some of these uncertainties may affect the settlement of claims that began prior to COVID-19 being declared a pandemic. At this point, it is not possible to reliably forecast these impacts. The COVID-19 pandemic may have a material impact on our Cash Flow NPV estimates as its effects emerge.

The predictive models used in this analysis are based on a theoretical framework and certain assumptions. This model structure predicts the rates of default, claim, loss and prepayment based on a number of individual

mortgage characteristics and economic variables. The models are built using predictive modeling techniques, analyzing data from actual historical experience of FHA-insured mortgages. The parameters of the predictive models are estimated over a wide variety of mortgages originated since 1975 and their performance under the range of economic conditions and mortgage market environments experienced during the past 44 years. The predictive models are combined with assumptions about future behavior of current mortgage endorsements and certain key economic assumptions to produce future projections of the performance of the existing mortgages insured by the MMI.

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

Section 1: Introduction

Scope

HUD and FHA have engaged Pinnacle to perform the annual independent Actuarial Review of the MMI. This study is required by 12 USC 1708(a)-(4) and must be completed in compliance with the Federal Credit Reform Act as implemented and all applicable Actuarial Standards of Practice (ASOPs). This study provides an analysis of the financial position of MMI as of September 30, 2020 using data through September 30, 2020.

The MMI is a group of accounts of the federal government which records transactions associated with the FHA's guarantee programs for single family mortgages. Currently, the FHA insures approximately 7.91 million forward mortgages under the MMI and 434,938 reverse mortgages under the HECM program.

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

The deliverables included in this study, as defined by the Statement of Work, are as follows:

1. Produce a written Actuarial Study for Forward that provides the actuarial central estimate of MMI Economic Net Worth as of the end of the subject Fiscal Year and assesses HUD's estimates of Economic Net Worth.

2. Include a review of the risk characteristics of existing MMI loans including commentary on how such characteristics have changed in recent years.

3. Apply the final Forward actuarial models to the existing portfolio to produce conditional (and cumulative) claim, prepayment, and loss-given-default rates at various levels of aggregation across loans, and for individual policy years and policy year-quarter. Cash-flow summaries shall also be provided for major categories (e.g., premium revenues, claim expenses and recoveries or net loss due to claim, with affected loan counts and balances).

4. To promote transparency of the Study's assessments, the Study shall identify methodological vulnerabilities that may occur in its actuarial models or in HUD's analyses of Economic Net Worth. This discussion shall evaluate the scope and scale of such vulnerabilities in creating possible forecast risk and suggest possible lines of research in these areas. The Study shall assess and comment upon HUD's own models that estimate Economic Net Worth for methodological vulnerabilities and compare HUD's methodologies with those in the Study.

5. The Study shall include historical data on changes in program terms as well as relevant loan and borrower characteristics (e.g., credit scores, loan-to-value ratios) by cohort and other sub-populations. Loan performance data (claim rates, prepayment rates, severity and recovery rates), both historical and projected, shall be presented in the "finger-table" formats (arrayed by cohort and policy years for different loan products).

6. The Contractor shall use the President's Economic Assumptions (PEA), provided by Office of Risk Management and Regulatory Affairs (ORMRA) for the Actuarial Central Estimates (ACE) of the Study. However, in addition to the central single path economic forecast, the Study shall test alternative economic forecasts for stress-testing and sensitivity analysis to estimate ranges of reasonableness.

7. To provide comparability to HUD estimates of Economic Net Worth, the Contractor shall use Federal Credit Reform Act discounting assumptions and procedures.

8. This Study shall use stochastic or Monte Carlo simulations of future economic conditions, including for interest rates and house price appreciation. The objective of these requirements is to illustrate the sensitivity of forecasts to economic uncertainty and other forms of forecast error.

9. Provide econometric appendices to the Study that include variable specifications and statistical output from all regressions in the Study. Individual estimation equations shall not be combined for reporting.

Background

HUD was established in 1937 by the U.S. Housing Act of 1937. The current mission of HUD is:

> *…to create strong, sustainable, inclusive communities and quality affordable homes for all. HUD is working to strengthen the housing market to bolster the economy and protect consumers; meet the need for quality affordable rental homes; utilize housing as a platform for improving quality of life; build inclusive and sustainable communities free from discrimination, and transform the way HUD does business.*[1]

Congress created FHA in 1934. The FHA "provides mortgage insurance on loans made by FHA-approved lenders throughout the United States and its territories. FHA insures mortgages on single family and multifamily homes, including manufactured homes and hospitals. It is the largest insurer of mortgages in the world, insuring over 34 million properties since its inception in 1934."[2] The mortgage insurance provided was done so through the establishment of the MMI.

The National Affordable Housing Act (NAHA), enacted in 1990, introduced a minimum capital requirement for the MMI[3]. By 1992, the capital ratio was to be at least 1.25%, and by 2000 the capital ratio was to be no less

[1] https://portal.hud.gov/hudportal/HUD?src=/about/mission
[2] https://portal.hud.gov/hudportal/HUD?src=/program_offices/housing/fhahistory
[3] Public Law 101-625, 101st Congress, November 28, 1990, Section 332.

than 2.0%. The capital ratio is defined by NAHA as the ratio of capital to unamortized IIF. NAHA also implemented the requirement that an independent actuarial study of the MMI be completed annually. The Housing and Economic Recovery Act (HERA) amended 12 USC 1708(a)-(4) to include the requirement for the annual Actuarial Study.

Given the purpose of HUD and FHA, availability of mortgages to a broad segment of the home-buying market is important to promote and strengthen the U.S. housing market. However, the capital requirements established by NAHA can potentially be in conflict with the desire for widespread availability of mortgage insurance. Since the implementation of NAHA, many of the steps taken by HUD have attempted to balance broader availability of mortgage insurance and the financial stability of the MMI.

Mortgage Insurance Premiums

Adequate mortgage insurance premium (MIP) is key in maintaining the economic strength of the MMI, but the level of MIP can also impact the ability of potential home buyers to afford a home. A summary of the adjustments in MIP since 1991 is shown below:

- In 1991, it was established that MIP would be determined as the combination of an upfront MIP and a yearly premium which was a percentage of the remaining outstanding mortgage balance each year.[4] Overall, this represented an increase in MIP, which was needed to help meet the new capital requirement established by NAHA.

- In 1994, the upfront MIP was decreased by 75 basis points to 2.25%.[5] This was in response to improved financial experience of the MMI.

- In 1996, the upfront MIP was decreased by 25 basis points to 2.00% for first-time homebuyers that received mortgage counseling prior to purchasing their home.[6] This was implemented based on the success of a pilot program which showed that first-time homebuyers who received this counseling had better default experience.

- In 1997, the upfront MIP was decreased by an additional 25 basis points to 1.75% for first-time homebuyers that received mortgage counseling prior to purchasing their home. In total, the upfront MIP was 50 basis points lower than it would be for a homebuyer who did not receive counseling.[7]

[4] Mortgagee Letter 91-26, May 30, 1991: Single Family Insurance Processing for Risk Based Insurance Premiums.
[5] Mortgagee Letter 94-14, March 31, 1994: Single Family Loan Production – Reduced Upfront Mortgage Insurance Premium (UFMIP).
[6] Mortgagee Letter 96-48, August 28, 1996: Single Family Production – Reduction in Up-Front Mortgage Insurance Premiums (UFMIP) for First-Time Homebuyers Who Receive Housing Counseling.
[7] Mortgagee Letter 97-37, August 13, 1997: Single Family Production – Further Reduction in Up-Front Mortgage Insurance Premiums (UFMIP) for First-Time Homebuyers Who Receive Housing Counseling.

- In 2000, in recognition of the improved experience of the MMI, several changes were implemented. First, the upfront MIP was reduced by 75 basis points to 1.50%. Second, the upfront MIP refund schedule was shortened to five years instead of seven years. Third, a provision to cancel the annual MIP once the loan-to-value (LTV) ratio was 78% or less was implemented. Also, the discount in the upfront MIP for first-time homebuyers that received counseling was discontinued.[8]

- In April of 2010, upfront MIP was increased by 75 basis points to 2.25%.[9] This increase in premium was in response to the housing and economic crisis of 2008, and was the first in a series of increases over the next three years.

- In October of 2010, upfront MIP was decreased but annual MIP was increased significantly.[10] Overall, this resulted in an increase in MIP.

- In 2011, the annual MIP was increased by 25 basis points.[11]

- In 2012, the annual MIP was increased by 10 basis points.[12]

- In 2013, several changes were implemented related to annual MIP. First, the term for collection of MIP was extended to 11 years for mortgages with an initial LTV ratio of 90% or less, and for 30 years for mortgages with an initial LTV ratio of greater than 90%. Second, mortgages with terms of 15 years or less and LTV ratio of 78% or less at the time of origination, which were exempt from MIP, would no longer be exempt. Lastly, the annual MIP was increased by 5 to 10 basis points for mortgages with terms of 15 years or less and LTV ratios of 78% or less at origination.[13]

- As a result of improved financial experience, in 2015 annual MIP rates were decreased by 50 basis points for loans with terms greater than 15 years.[14]

[8] Mortgagee Letter 2000-38, October 27, 2000: Single Family Loan Production – Further Reduction in Upfront Mortgage Insurance Premiums and Other Mortgage Insurance Premium Changes.
[9] Mortgagee Letter 2010-02, January 21, 2010: Increase in Upfront Premiums for FHA Mortgage Insurance.
[10] Mortgagee Letter 2010-28, September 1, 2010: Changes to FHA Mortgage Insurance Premiums.
[11] Mortgagee Letter 2011-10, February 14, 2011: Annual Mortgage Insurance Premium Changes and Guidance on Case Numbers.
[12] Mortgagee Letter 2012-04, March 6, 2012: Single Family Mortgage Insurance: Annual and Up-Front Mortgage Insurance Premium – Changes.
[13] Mortgagee Letter 2013-04, January 31, 2013: Revision of Federal Housing Administration (FHA) policies concerning cancellation of the annual Mortgage Insurance Premium (MIP) and increase to the annual MIP.
[14] Mortgagee Letter 2015-01, January 9, 2015: Reduction of Federal Housing Administration (FHA) annual Mortgage Insurance Premium (MIP) rates and Temporary Case Cancellation Authority.

- In 2017, a decrease was proposed for annual MIP rates,[15] but this decrease was suspended later in the year.[16]

Down Payment and Closing Costs

The source of funds for down payment and closing costs has been a significant issue for HUD. There are limitations on closing costs and down payment assistance that can be provided by sources other than the borrower or family, and there have been several mortgagee letters addressing this issue. Allowing assistance with down payments and closing costs increases the opportunity for more people to achieve homeownership. Historically, however, mortgages for which a larger percentage of the down payment and closing costs were provided by sources other than the borrowers own funds have demonstrated poorer performance. A summary of mortgagee letters addressing this is provided below:

- Prior to 1992, closing costs could not be financed in the loan. In 1992, the limitation on financing of closing costs was removed, but mortgages were still subject to LTV ratio limits.[17] This provision was implemented to make it easier for homebuyers to meet the down payment requirements.

- In 1996, HUD allowed family members to lend the borrower 100% of the down payment.[18] This also was intended to make it easier for borrowers to achieve homeownership.

- Two provisions were implemented in 1998. First, it was prohibited for the seller or any other party to pay mortgage interest for the buyer. In addition, any interest rate buydown could not result in a reduction in the interest rate of more than 2% below the note rate. These changes were implemented to avoid a significant increase in the payment amount once the seller-paid mortgage interest funds were depleted or the interest rate buydown term was complete.[19]

- In 2000, guidance was provided by HUD to mortgagees to ensure that the source of the gifts to buyers is documented, and the person giving the gift must certify that the funds did not come from someone with an interest in the transaction. This was implemented to combat a practice of the sellers providing funds to family members of the buyer that would then be used for the down payment.[20]

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[15] Mortgagee Letter 2017-01, January 9, 2017: Reduction of Federal Housing Administration (FHA) Annual Mortgage Insurance Premium (MIP) Rates.
[16] Mortgagee Letter 2017-07, January 20, 2017: Suspension of Mortgagee Letter 2017-01 – Reduction of Federal Housing Administration (FHA) Annual Mortgage Insurance Premium (MIP) Rates.
[17] Mortgagee Letter 92-39, October 16, 1992: Single Family Loan Production - Elimination of Limit on Financing Closing Costs.
[18] Mortgagee Letter 96-58, October 23, 1996: Single Family Loan Production - Secondary Financing from Family Members.
[19] Mortgagee Letter 98-1, January 2, 1998: Single Family Loan Production - Underwriting Adjustable Rate Mortgages, Interest Buydowns, Homeownership Counseling and Other Credit Policy Issues
[20] Mortgagee Letter 2000-28, August 7, 2000: Gift Documentation, Mortgage Forms and other Credit Policy and Appraisal Issues.

- In 2001, HUD withdrew its proposed rule on Sources of Homeowner Downpayment that would have prohibited gifts from non-profit organizations being used for the mortgagor's investment in a mortgaged property if the organization received the funds for the gift either directly or indirectly from the seller.

- Section 2113 of the Housing And Economic Recovery Act Of 2008 prohibited downpayment contributions from a seller or any other person or entity that would financially benefit from the transaction.

- In 2019, guidance by HUD was provided to clarify the rules associated with funds being provided by a governmental source for down payment assistance. The mortgagee letter requires the mortgagee to verify that the funds provided by the government agency were transferred to the Borrower before or at the time of closing, and that the governmental agency was acting in its legal capacity in providing these funds. Documentation is also required from the government that the agency has the authority to provide the funds, and from an attorney for the government entity verifying that the property is within the government agency's jurisdiction. There can be no direct transfer of assistance from the government agency to the mortgagee, and there can be no requirement that the loan be transferred to a specific mortgagee as a condition of receiving assistance from the government agency.[21]

  This guidance was subsequently suspended until further notice[22] and ultimately rescinded.[23]

Homebuyer Counseling

Counseling for homebuyers was encouraged historically by FHA with the idea that if homebuyers were educated on issues of homeownership and mortgages, they would be less likely to default on the mortgage and would be more responsible homeowners. The history of mortgagee letters related to homebuyer counseling is outlined below:

- In 1993, a pilot of a counseling program for pre-purchase and pre-foreclosure situations was announced.[24]

- In 1996, after the pilot of the counseling program, the upfront MIP was decreased by 25 basis points for first-time homebuyers who complete homeownership counseling.[25] Just one year later in 1997, the

[21] Mortgagee Letter 19-06, April 18, 2019: Downpayment Assistance and Operating in a Governmental Capacity.
[22] Mortgagee Letter 19-10, July 23, 2019: Suspension of the Effective Date of Mortgagee Letter 2019-06, *Downpayment Assistance and Operating in a Governmental Capacity*.
[23] Mortgagee Letter 19-12, August 13, 2019: Rescission of Mortgagee Letters 2019-06, *Downpayment Assistance and Operating in a Governmental Capacity*; 2019-07, *Extension of the Effective Date of Mortgagee Letter 2019-06, Downpayment Assistance and Operating in a Governmental Capacity*; and 2019-10, *Suspension of the Effective Date of Mortgagee Letter 2019-06, Downpayment Assistance and Operating in a Governmental Capacity*.
[24] Mortgagee Letter 93-28, September 20, 1993: Prepurchase and Foreclosure Prevention Counseling Demonstration.
[25] Mortgagee Letter 96-48, August 28, 1996: Single Family Production - Reduction in Up-Front Mortgage Insurance

upfront MIP was decreased by an additional 25 basis points for first-time homebuyers who complete homeownership counseling.[26] This discount was provided to recognize expected improvement in default experience.

- In 1998, a mortgagee letter was released indicating that the homeownership counseling program would be reviewed. This was in response to homeownership counseling programs that were being used that did not meet FHA guidelines. While the requirements of the counseling program were that it should involve 15 to 20 hours of instruction, there were cases where homebuyers were being provided with workbooks without additional interaction or instruction. The guidelines of the homeownership counseling program were reiterated in this letter.[27]

- In 2000, in conjunction with an overall reduction in upfront MIP, the homeownership counseling discount was discontinued.[28]

Automated Underwriting Systems

Beginning in 1995, the use of automated underwriting systems (AUSs) began to increase. Theoretically, the use of AUSs increases the availability of mortgages, and improves the efficiency and speed of mortgage processing:

- In 1995, HUD approved usage of AUSs. Mortgagees had to request permission to use these systems and receive approval from HUD.[29]

- In 1996, criteria were established for the approval by HUD of AUSs.[30]

In 1998, FHA approved Freddie Mac's Loan Prospector for underwriting FHA-insured mortgages, using a scorecard custom-estimated for FHA endorsed loans. 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 AUS in its insurance endorsement process. Fannie Mae's Desktop Underwriter and PMI Mortgage Services' Automated Underwriting Risk Analysis (AURA) were approved to underwrite FHA mortgages in 1999, followed soon thereafter by Countrywide Funding Corporation's Countrywide Loan-Underwriting Expert System (CLUES) and JP Morgan-Chase's Zippy. Beginning in May 2004, all approved AUSs applied FHA's Technology-Open-To-Approved-Lenders (TOTAL) mortgage scorecard to evaluate

Premiums (UFMIP) for First-Time Homebuyers Who Receive Housing Counseling.
[26] Mortgagee Letter 97-37, August 13, 1997: Single Family Production - Further Reduction in Up-Front Mortgage Insurance Premiums (UFMIP) for First-Time Homebuyers Who Receive Housing Counseling.
[27] Mortgagee Letter 98-1, January 2, 1998: Single Family Loan Production - Underwriting Adjustable Rate Mortgages, Interest Buydowns, Homeownership Counseling and Other Credit Policy Issues.
[28] Mortgagee Letter 2000-38, October 27, 2000: Single Family Loan Production - Further Reduction in Upfront Mortgage Insurance Premiums and Other Mortgage Insurance Premium Changes
[29] Mortgagee Letter 95-7, January 27, 1995: Single Family Loan Production - Revised Underwriting Guidelines and Other Policy Issues.
[30] Mortgagee Letter 96-34, July 10, 1996: Single Family Loan Production - Automated Underwriting Systems.

loan applications for possible automated approval for FHA insurance. Initially, more than two-thirds of loans submitted generally received automated approval, eliminating the need for manual underwriting reviews. Since May 2004, HUD required lenders to submit borrower credit scores. Starting in July 2008, all loans were to be submitted through FHA's TOTAL scorecard. Additional guidance issued in February 2011 prohibited the use of the TOTAL scorecard on streamline refinance transactions.

Adjustable Rate Mortgages

Adjustable rate mortgages (ARMs) are mortgages where the interest rate adjusts over the life of the loan. The interest rate adjustments are tied to interest rate indexes, such as Constant Maturity Treasury (CMT) rates. The interest rate at the beginning of the loan is typically lower than the prevailing fixed rate mortgage, and increases over the early years of the loan. The initial interest rate can be fixed for a varying period of time (one year, three years, five years, etc.) and, after the fixed interest rate period, can change yearly. Most ARMs also have a lifetime cap on how much the interest rate can increase relative to the initial interest rate.

Historically, the default rates related to ARM's have been higher than the default rates for fixed rate mortgages. This is based in part on the fact that as the interest rate increases, the monthly mortgage payment increases, and, as a result, the likelihood of borrower defaults increases. However, there is an offsetting impact, as the likelihood of prepayments decrease as interest rates increase. To address this, HUD has issued a series of mortgagee letters related to ARMs:

- In 1998, HUD issued guidance that for ARMs, borrowers must qualify using mortgage payments based on the contract or initial rate plus one percent, which effectively represents the second year interest rate. This applied to all mortgages with LTV ratios of greater than or equal to 95%. In addition, it prohibited any form of a temporary interest rate buydown. This was due to the fact that the payment shock associated with the termination of the buydown was causing default rates to increase to an unacceptable level.[31]

- In 2004, HUD expanded mortgage insurance availability to cover three-, five-, seven- and 10-year ARMs.[32]

- In 2007, the one-year London Interbank Offered Rate (LIBOR) was added as an acceptable index for ARMs.[33]

Foreclosure Avoidance and Loss Mitigation Programs

The pre-foreclosure sale (PFS) program allows mortgagors to sell their homes and use the proceeds to satisfy their mortgage debt obligations even if the proceeds were less than owed. Ultimately, these programs help limit

[31] Mortgagee Letter 98-1, January 2, 1998: Single Family Loan Production - Underwriting Adjustable Rate Mortgages, Interest Buydowns, Homeownership Counseling and Other Credit Policy Issues.
[32] Mortgagee Letter 2004-10, March 19, 2004: Adjustable Rate Mortgages.
[33] Mortgagee Letter 2007-13, October 12, 2007: Adjustable Rate Mortgages—Addition of LIBOR Index.

the number of defaults that turn into claims, and also limit the losses sustained by MMI when a claim occurs. Over the years, FHA has issued a number of mortgagee letters related to foreclosure and loss mitigation:

- In 1996, a mortgagee letter was released to provide information on the loss mitigation procedures, including special forbearance plans, mortgage modifications, PFSs, deeds in lieu of foreclosure and partial claims. The primary objective was to keep the homeowner in the home, and if that was not possible then the objective was disposition of the property without full foreclosure.[34]

- In 2008, due to the increase in defaults resulting from the housing crisis, FHA released a mortgagee letter reminding mortgagees of PFS as an option and also consolidated the provisions of the PFS program into one place. This letter also updated provisions of the PFS to better address the mortgage crisis.[35]

- In 2010, FHA released a mortgagee letter announcing enhancements to the FHA refinance program to allow responsible borrowers an opportunity to stay in their homes. This could occur if the lender agreed to write off at least 10% of the principal balance and if the remaining loan provisions were met.[36]

- In 2011, FHA issued guidance requiring a trial payment program prior to completing a permanent loan modification or partial claim. During the trial payment period, the borrower must complete three months of payments at the amount that will continue under the modification.[37]

- In 2012, FHA revised the Loss Mitigation Home Retention Options to reduce the claims against the MMI and help more borrowers stay in their homes. These revisions included eliminating the maximum Back End Debt to Income ratio; eliminating the restriction on the principal, interest, taxes and insurance that can be included in the claim; and, eliminating the requirement that the existing mortgage be no more than 12 months past due.[38]

- In 2013, FHA established updated requirements for PFSs and Deed in Lieu (DIL) requirements. These changes included the use of the Deficit Income Test (DIT) and the elimination of the financial hardship/deficit income PFS requirement for servicemen who have received a Permanent Change of Station order.[39]

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[34] Mortgagee Letter 96-61, November 12, 1996: FHA Loss Mitigation Procedures - Special Instructions.
[35] Mortgagee Letter 2008-43, December 24, 2008: Pre-Foreclosure Sale (PFS) Program - Utilizing the PFS Loss Mitigation Option to Assist Families Facing Foreclosure.
[36] Mortgagee Letter 2010-23, August 6, 2010: FHA Refinance of Borrowers in Negative Equity Positions.
[37] Mortgagee Letter 2011-28, August 15, 2011: Trial Payment Plan for Loan Modifications and Partial Claims under Federal Housing Administration's Loss Mitigation Program.
[38] Mortgagee Letter 2012-22, November 16, 2012: Revisions to FHA's Loss Mitigation Home Retention Options.
[39] Mortgagee Letter 2013-23, July 9, 2013: Updated Pre-Foreclosure Sale (PFS) and Deed in Lieu (DIL) of Foreclosure Requirements.

- In 2013, additional modifications were made to the FHA Loss Mitigation Home Retention Options. These changes included defining continuous income that can be considered in the transaction, allowing for arrearages to be included in partial claims, and allowing for modifications for mortgagors in bankruptcy.[40]

- In 2014, the updated PFS guideline required a minimum marketing period of 15 calendar days for all PFS transactions. It also clarified that non-arms-length transactions are permitted only if they are necessary to comply with state law.[41]

- Also in 2014, FHA issued a mortgagee letter to increase the use of Claims Without Conveyance of Title (CWCOT) procedures. This letter also established that the Commissioner's Adjusted Fair Market Value must be used for all foreclosure sales and PFS efforts.[42]

- In 2018, FHA issued a mortgagee letter implementing special loss mitigation processes for victims of Hurricanes Irma, Harvey and Maria and the California Wildfires. These procedures were implemented to help homeowners stay in their homes and reduce losses to FHA.[43]

- Later in 2018, FHA issued a mortgagee letter in response to continued elevated default rates and lower utilization of loss mitigation options in Puerto Rico and the U.S. Virgin Islands. This mortgagee letter expanded loss mitigation assistance to borrowers in default.[44]

- In 2019, HUD incorporated additional changes to further streamline and revise Loss Mitigation

[40] Mortgagee Letter 2013-32, September 20, 2013: Update to FHA's Loss Mitigation Home Retention Options.
[41] Mortgagee Letter 2014-15, July 10, 2014: Updated Requirements for Pre-Foreclosure Sales (PFS) and Deeds in Lieu (DIL) of Foreclosure.
[42] Mortgagee Letter 2014-24, November 26, 2014: Increasing Use of FHA's Claims Without Conveyance of Title (CWCOT) Procedures.
[43] Mortgagee Letter 2018-01, February 22, 2018: Loss Mitigation for borrowers with FHA-insured mortgages whose property and/or place of employment is located in Presidentially-Declared Major Disaster Areas, adversely affected by Hurricanes Harvey, Irma, Maria, certain California wildfires that occurred in October 2017 (FEMA-DR-4344) or certain California Wildfires, Flooding, Mudflows, and Debris Flows that occurred in December 2017 (FEMA-DR-4353).
[44] Mortgagee Letter 2018-05, August 15, 2018: Updated Loss Mitigation for mortgagees servicing mortgage loans for borrowers with FHA-insured mortgages whose property and/or place of employment is located in the Presidentially-Declared Major Disaster Areas (PDMDAs) of Puerto Rico Hurricane Maria DR-4339 or Virgin Islands Hurricane Maria DR-4340 and Disaster Foreclosure Moratorium for certain FHA-insured mortgages secured by properties located in areas of Puerto Rico and the U.S. Virgin Islands that the U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) has declared to be eligible for Individual Assistance (Affected Counties) as a result of Hurricane Maria (Puerto Rico Hurricane Maria DR-4339 and Virgin Islands Hurricane Maria DR-4340).

Procedures for Presidentially Declared Major Disaster Areas (PDMDAs).[45]

COVID-19 Pandemic

The President of the United States proclaimed that the COVID-19 outbreak in the United States constitutes a national emergency as of March 1, 2020. As a result, for a period of time many jurisdictions reduced services, businesses closed, and other activities were curtailed. In addition, the pandemic has impeded the ability of Americans to work and provide for their families. This directly impacts the financial wellbeing of individuals, families, and businesses. Furthermore, many Americans have been asked to remain in their homes to stem the tide of COVID-19 as many states implemented shelter-in-place orders. To ensure families are not displaced during this critical period, several mortgagee letters were issued.

- March 18, 2020: Properties secured by FHA-insured mortgages were subject to a 60-day moratorium on foreclosures. This moratorium applied to the initiation of foreclosures and foreclosures in process.[46] On May 14, 2020, the foreclosure moratorium was extended through June 30, 2020.[47] On June 17, 2020, the moratorium was extended through August 31, 2020,[48] and on August 27, 2020 the moratorium was extended through December 31, 2020.[49] Deadlines for the first legal action and reasonable diligence times were extended by 90 days from the date of the expiration of the moratorium.

- March 27, 2020: Rules for re-verification of employment were adjusted to account for the fact that many businesses were closed during shelter-in-place orders. Also, changes were made to FHA Appraisal Protocols to allow for exterior only and desktop appraisals in order to maintain appropriate social distancing.[50] On May 14, 2020, the applicability of this changes were extended through June 30, 2020.[51] On June 29, 2020, the applicability of these changes were extended through August 31, 2020.[52] On

[45] Mortgagee Letter 2019-14, August 29, 2019: Updates to FHA's Loss Mitigation Options for Borrowers in Presidentially-Declared Major Disaster Areas (PDMDAs)
[46] Mortgagee Letter 2020-04, March 18, 2020: Foreclosure and Eviction Moratorium in connection with the Presidentially Declared COVID-19 National Emergency.
[47] Mortgagee Letter 2020-13, May 14, 2020: Extension of Foreclosure and Eviction Moratorium in connection with the Presidentially-Declared COVID-19 National Emergency and New Reporting Requirements Related to FHA Single Family's CARES Act Loss Mitigation Options.
[48] Mortgagee Letter 2020-19, June 17, 2020: Extension of Foreclosure and Eviction Moratorium in Connection with the Presidentially-Declared COVID-19 National Emergency.
[49] Mortgagee Letter 2020-27, August 27, 2020: Extension of Foreclosure and Eviction Moratorium in Connection with the Presidentially-Declared COVID-19 National Emergency.
[50] Mortgagee Letter 2020-05, March 27, 2020: Re-verification of Employment and Exterior-Only and Desktop-Only Appraisal Scope of Work Options for FHA Single Family Programs Impacted By COVID-19.
[51] Mortgagee Letter 2020-14, May 14, 2020: Extension of the Effective Date of Mortgagee Letter 2020-05, Re-verification of Employment and Exterior-Only and Desktop-Only Appraisal Scope of Work Options for FHA Single Family Programs Impacted By COVID-19.
[52] Mortgagee Letter 2020-20, June 29, 2020: Re-Extension of the Effective Date of Mortgagee Letter 2020-05, Re-verification of Employment and Exterior-Only and Desktop-Only Appraisal Scope of Work Options for FHA Single Family Programs Impacted By COVID-19.

August 28, 2020, the applicability of these changes was extended through October 31, 2020.[53]

- April 1, 2020: Borrowers who experienced an adverse impact on their ability to make on-time mortgage payments were eligible for forbearance for an initial period of six months, and this initial period can be extended by up to six additional months. While in forbearance, the borrower must be evaluated for loss mitigation options.[54] On July 8, 2020, HUD issued a mortgagee letter detailing the full suite of loss mitigation options available for borrowers affected by COVID-19.[55] On October 20, 2020, the date for approving a COVID-19 forbearance was extended to December 31, 2020.[56]

- June 4, 2020: Mortgages under forbearance due to the effects of COVID-19 were allowed to be endorsed by HUD if at the time of the closing the buyer met all necessary requirements and the mortgage was current at the time of forbearance.[57]

- June 12, 2020: Claims for loss mitigation options were allowed to be submitted electronically.[58]

The COVID-19 pandemic, the shelter-in-place orders and the modifications to the loss mitigation and forbearance guidelines will have a significant impact on the Cash Flow NPV of the MMI. We have considered these impacts as part of our analysis, and will highlight throughout the report how COVID-19 has impacted our analysis and the Cash Flow NPV projections.

Current and Future Market Environment

In addition to the policies related to the MMI, the default and claim rate and ultimately the Cash Flow NPV of the MMI are dependent on the economic environment. As interest rates increase, mortgage rates tend to increase, which in turn causes default rates to increase. The general health of the economy impacts the value of homes. As home values increase, losses to the MMI will tend to decrease as the value received in the disposition of a home increases. Also, as the general health of the economy improves, the demand for mortgages increases. This generally results in an increase in the demand for mortgages endorsed by the MMI for mortgage insurance.

The impacts of COVID-19 on the economy have been significant. For some of the economic variables considered

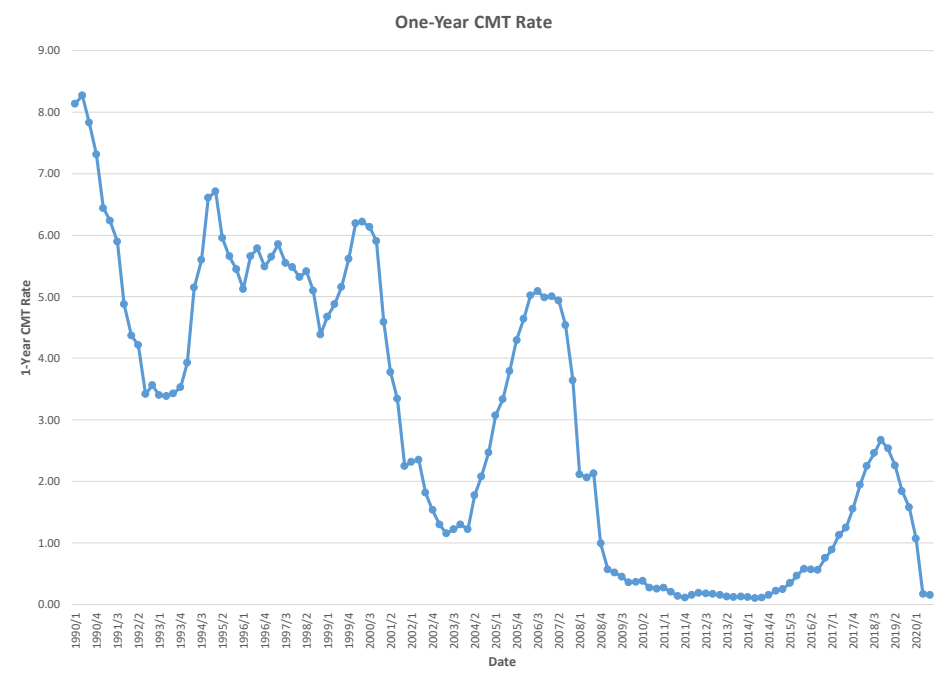
[53] Mortgagee Letter 2020-28, August 28, 2020: Re-Extension of the Effective Date of Mortgagee Letter (ML) 2020-05, Reverification of Employment and Exterior-Only and Desktop-Only Appraisal Scope of Work Options for the Federal Housing Administration (FHA) Single Family programs impacted by the Coronavirus Disease of 2019 (COVID-19).
[54] Mortgagee Letter 2020-06, April 1, 2020: FHA's Loss Mitigation Options for Single Family Borrowers Affected by the Presidentially-Declared COVID-19 National Emergency in Accordance with the CARES Act.
[55] Mortgagee Letter 2020-22, July 8, 2020: FHA's COVID-19 Loss Mitigation Options.
[56] Mortgagee Letter 2020-34, October 20 2020: Update to the Date for Approving a COVID-19 Forbearance or COVID19 Home Equity Conversion Mortgage (HECM) Extension.
[57] Mortgagee Letter 2020-16, June 4 2020: FHA Catalyst: Case Binder Module – Single Family Forward and Home Equity Conversion Mortgage (HECM) Electronic Endorsement Submission.
[58] Mortgagee Letter 2020-18, June 12 2020: FHA Catalyst: Claims Module - Single Family Forward Loss Mitigation Home Retention Claims.

in the analysis, the impact of COVID-19 has caused levels that have not been seen historically. Throughout the analysis, we have analyzed the impact of COVID-19 on economic and other variables and the Cash Flow NPV.

Interest Rates

Figure 1 shows the historical one-year CMT rate since 1990.

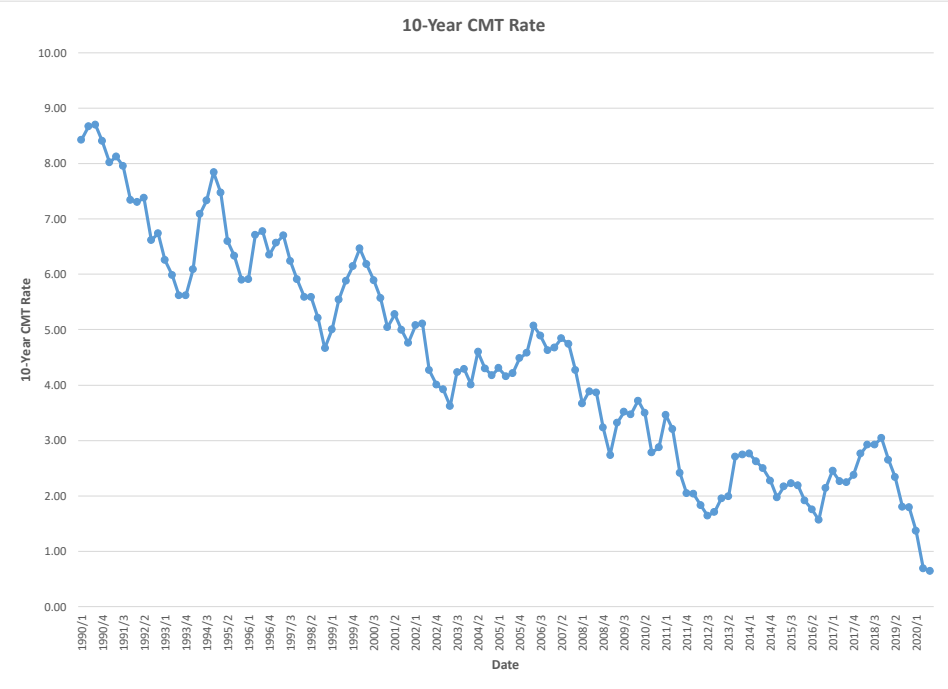
Figure 1: One-Year CMT Rate



In 2008, in response to the housing crisis and economic recession, the Federal Reserve began decreasing interest rates as part of an active monetary policy. At the beginning of 2007, the one-year CMT rate was around 5%. Over the next seven years, the rate dropped steadily to a low of 0.1% in the fourth quarter of 2014. Subsequent to 2014, the rate began increasing again to a high of 2.7% by December 2018. Since that time the rate has been decreasing, and as of the third quarter of 2020, was at 0.17%, the lowest level since 2014. Recent decreases in the one-year CMT have been a direct result of monetary policy in response to the economic impact of COVID-19.

Figure 2 shows the 10-year CMT rate since 1990.

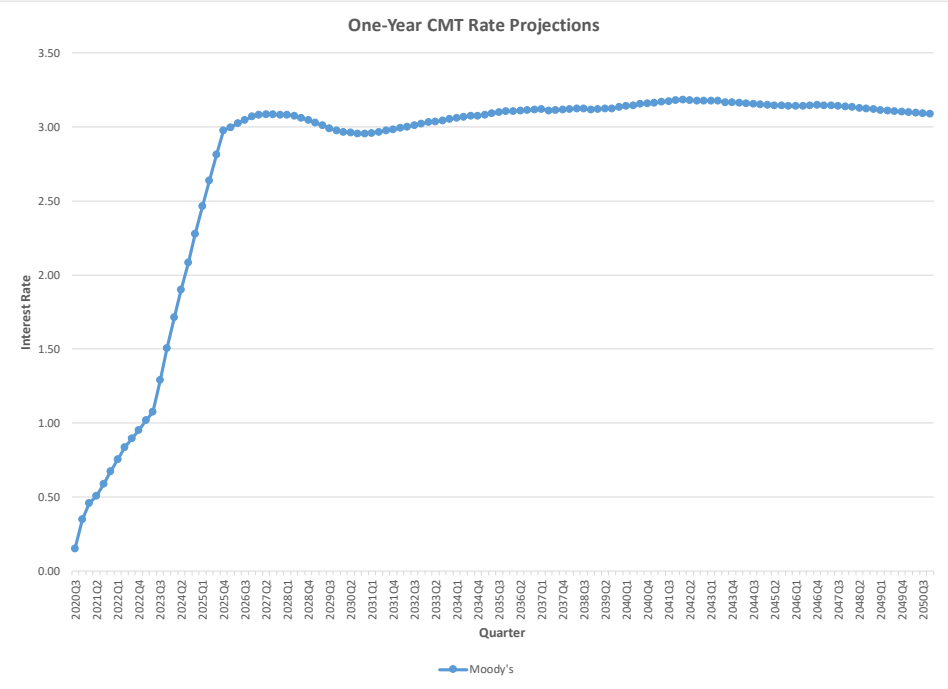
Figure 2: 10-Year CMT Rate



The 10-year CMT rate shows a similar trend, although the changes are not as significant. In mid-2007, the 10-year CMT rate was nearly 5%. Since that time, the rate dropped to under 2% in 2012. Subsequent to 2012, the rate increased to just over 3.0% by December 2018. The rate has since been decreasing, and due to the economic impacts of COVID-19 has dropped to 0.64%, the lowest level in the last 30 years.

For the purposes of projecting Cash Flow NPV, it is required that Pinnacle produce an estimate using the projection figures from the OMB. In addition to OMB projections, Pinnacle has also used Moody's economic projections to generate a range of indications of the economic value. Figure 3 shows the one-year CMT rate projections from Moody's Baseline Scenario.

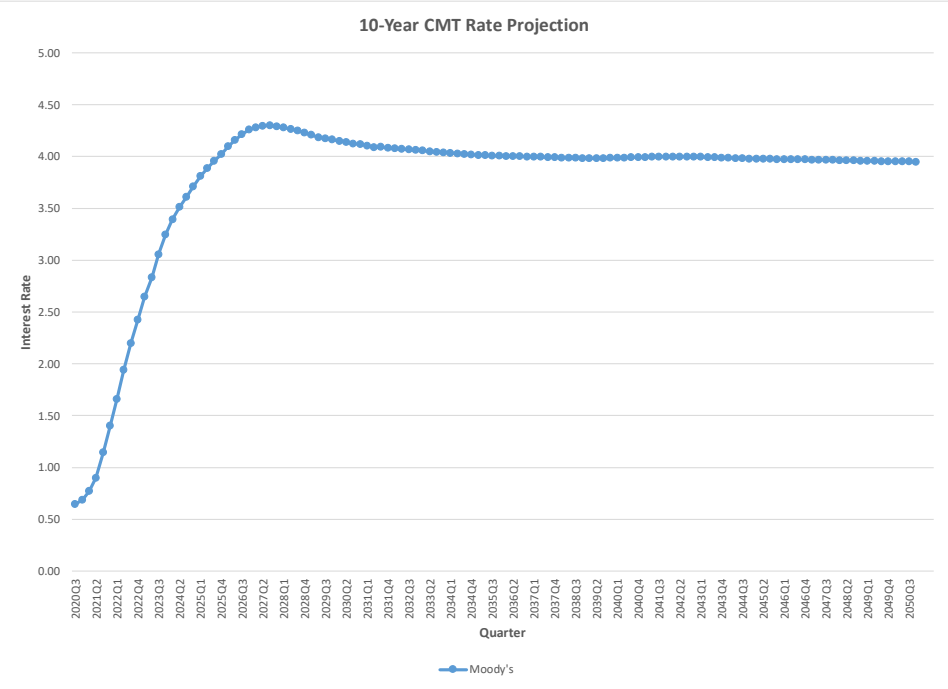
Figure 3: One-Year CMT Rate Projections



Moody's projections show increases in the one-year CMT rates. The rate increases to 3.1% by 2027, and then remains in the range of 2.9% to 3.2% for the rest of the projection period.

The 10-year CMT rate projections from Moody's are shown below.

Figure 4: 10-Year CMT Rate Projection

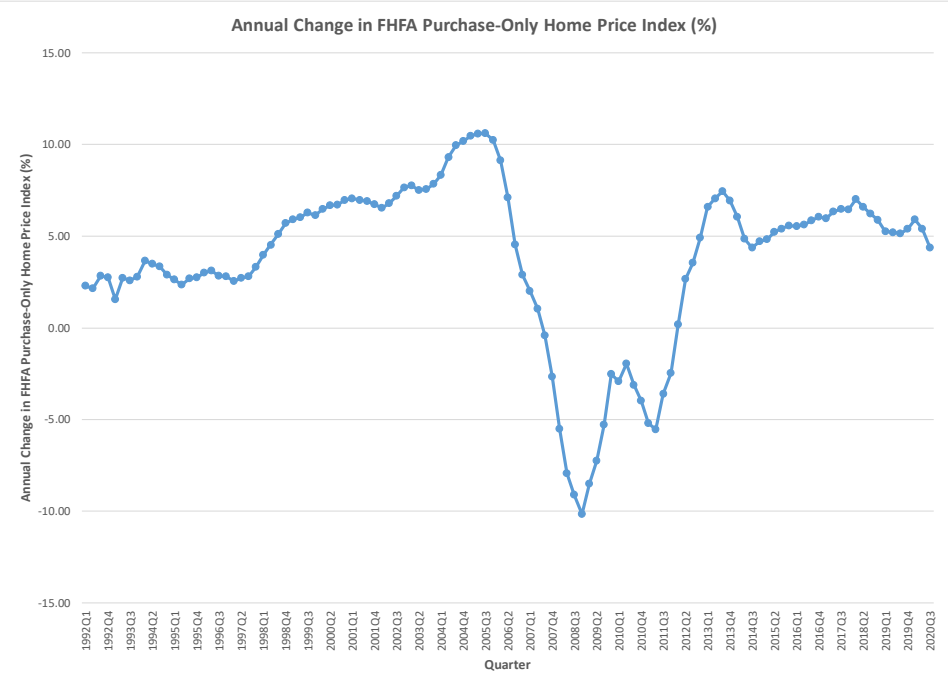


The 10-year CMT rate increases gradually and then stabilizes at approximately 4.0% by the end of the projection period.

Home Price Index Growth

The growth rate in home prices will have an impact on the volume of mortgages endorsed by FHA, the percentage of defaults in mortgages and the ultimate cost of the mortgage insurance claims. The annual percentage change in the historical Federal Housing Finance Agency (FHFA) Purchase Only House Price Index by quarter is shown below.

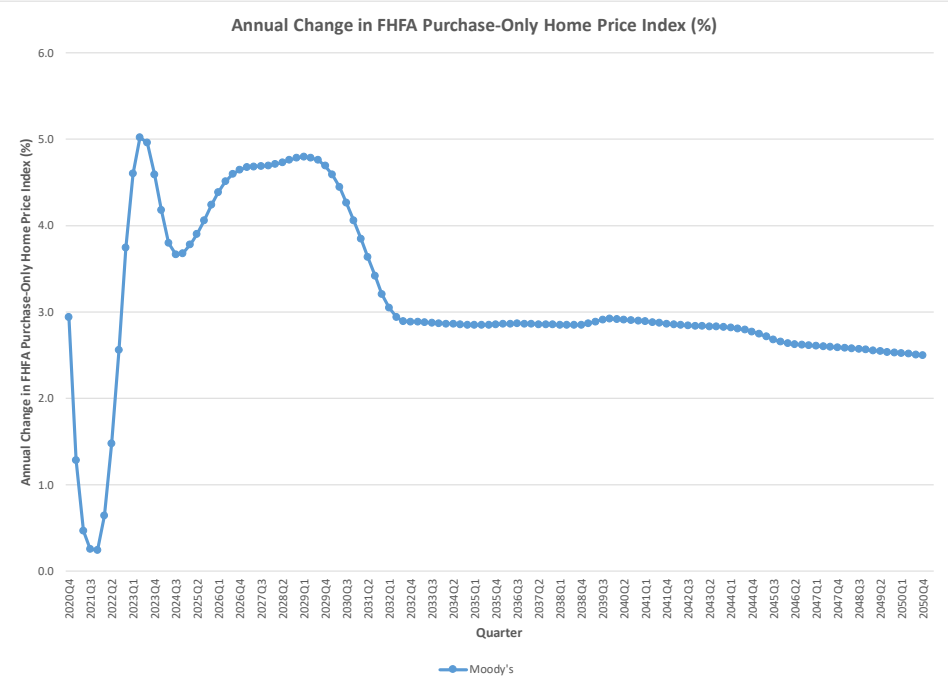
Figure 5: Historical FHFA Purchase Only House Price Index



From 1992 through 2005, the annual rate of change increased to a high of over 10%. During the housing crisis that began in 2006, the annual rate of change decreased significantly, dropping to a low of -10% in 2008 and remained negative through 2012. The increasing trend continued through 2013, and the rate then remained between 5% - 7% through the second quarter of 2020. The rate dropped to 4.4% in the third quarter of 2020.

Moody's projects the home price index to 2050. Moody's also produces a forecast for local areas, including metropolitan areas and states. The annual percentage change in the countrywide projected Federal Housing Finance Agency (FHFA) Purchase Only House Price Index by quarter is shown below for Moody's baseline projections.

Figure 6: FHFA Purchase Only House Price Index



For Moody's projections, the annual percentage change for the index decreases from about 2.9% to 0.2% in 2021. The rate then increases sharply to 5.0% by 2023, then decreases and stabilizes long-term near 3.0%.

Unemployment Rate

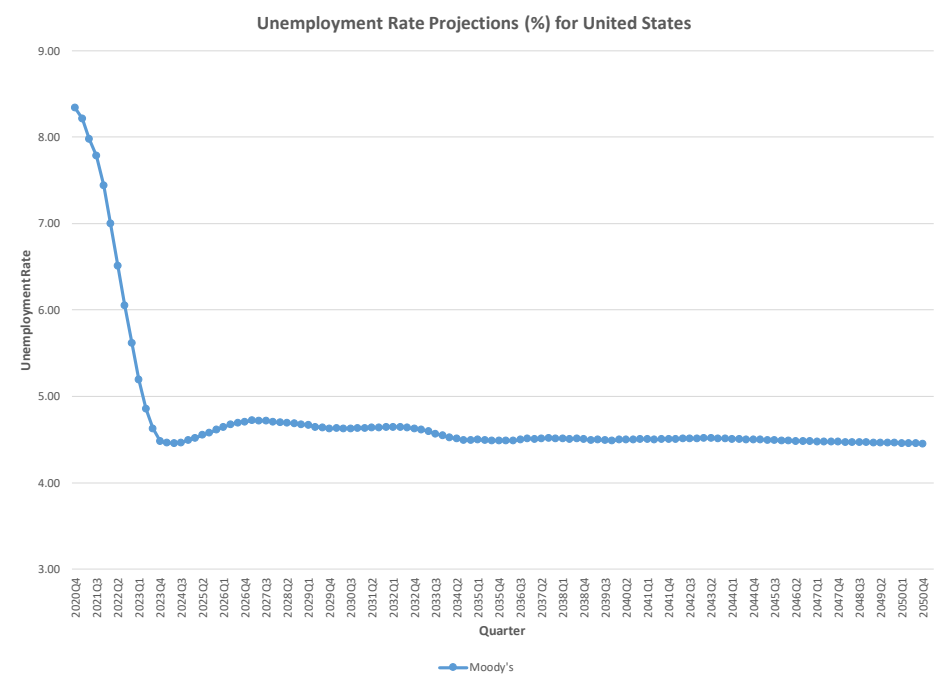
The unemployment rate has an impact on the ability of homeowners to make their mortgage payments. This impacts the default rates and ultimate projections of the MMI. The historical unemployment rate is shown below.

Figure 7: Historical Unemployment Rate

Beginning in 2008, as the economic downturn occurred, the seasonally adjusted unemployment rate nearly doubled from 5% to just under 10% by the end of 2009. Since 2009, the rate had decreased steadily to 3.5% by year-end 2019. In 2020, the economic issues associated with the COVID-19 pandemic resulted in an unemployment rate of 13% in the second quarter of 2020. The rate has dropped to 8.83% in the third quarter of 2020.

The projected unemployment rates from Moody's are shown in Figure 8.

Figure 8: Unemployment Rate Projection



Moody's projections show a significantly decreasing trend through 2024. The unemployment rate then continues to decrease slowly through the remainder of the projection period, remaining long-term at approximately 4.5%.

Mortgage Volume

The mortgage endorsement volume for FHA and the U.S. home market is shown in Table 5. The health and capacity of the private mortgage insurance market can impact the projected value of the MMI. If the private mortgage insurance market increases capacity and is successful in providing insurance to borrowers who are less likely to default, it could have an impact on the Cash Flow NPV of the MMI.

Table 5: FHA Share of Home Sales

	Volume of Home Sales ($ Billions)		
Calender Year	FHA	Market	FHA Share (%)
2001	89	958	9.3%
2002	82	1,096	7.5%
2003	71	1,273	5.6%
2004	53	1,306	4.1%
2005	37	1,506	2.5%
2006	36	1,401	2.5%
2007	39	1,142	3.5%
2008	129	741	17.5%
2009	185	653	28.3%
2010	167	539	31.0%
2011	129	503	25.7%
2012	127	598	21.2%
2013	119	731	16.3%
2014	107	762	14.0%
2015	154	896	17.2%
2016	176	1,049	16.7%
2017	174	1,140	15.2%
2018	158	1,207	13.1%
2019	170	1,270	13.4%
2020	135	963	14.0%

Sources: FHA Volume from FHA Data Warehouse, September 30, 2020 extract. Market volume from Mortgage Bankers Association.

FHA's share of the volume of home sales has increased significantly from its low of 2.5% in 2005 and 2006. From 2002 to 2006, FHA's share of the number and volume of home sales declined as the subprime mortgage market expanded from 2003 to 2007. The housing and economic crisis that occurred in 2008 decreased the availability of mortgages in general, and significantly impacted the availability of subprime mortgages. Private mortgage insurers were also facing significant losses and decreased the volume of insurance they were providing. As a result, FHA's market share began to increase significantly. The volume of FHA endorsed mortgages increased from 2.5% to 31.0% from 2006 to 2010. As the housing market has recovered, the percentage of loans endorsed by FHA had decreased steadily through 2018 to 13.1%. As of the third quarter of 2020, the FHA share has now increased to 14.0%. The increase in 2020 may be due in part to tightening of loan underwriting standards by private mortgage insurers in response to COVID-19.

Report Structure

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

- **Section 2. Summary of Findings and Comparison with Fiscal Year 2019 Actuarial Review** – presents the MMI Economic Net Worth for Fiscal Year 2020 and the projected Cash Flow NPV by cohort and product. This section also provides a reconciliation and explanation of the major differences between the Fiscal Year 2019 and Fiscal Year 2020 Reports.

- **Section 3. Cash Flow NPV Based on Alternative Scenarios** – presents estimates of the MMI Cash Flow

NPV using a range of alternative economic assumptions.

- **Section 4. Characteristics of the Fiscal Year 2020 Insurance Portfolio** – describes the Fiscal Year 2020 insurance portfolio and compares the risk characteristics of the origination books of business across historical Fiscal Years.

- **Section 5. Summary of Methodology** – presents an overview of the data processing, transition, loss severity and cash flow models used in the analysis.

- **Appendix A: Data Sources – Processing and Reconciliation** – provides a description of the data sources used for the analysis, the data processing required to prepare the data for analysis and the data reconciliation performed.

- **Appendix B: Transition Models** – provides a technical description of our predictive models of current and default transitions, the model parameters and model validation results.

- **Appendix C: Loss Severity Models** – provides a technical description of our predictive models of loss severity rates, the model parameters and model validation results.

- **Appendix D: Economic Scenarios** – describes the forecast of future values of economic factors that affect the performance of the MMI and presents the variation in estimated Cash Flow NPV based on the additional economic scenarios. Details of the stochastic analysis are also provided.

- **Appendix E: Cash Flow Analysis** – describes the process used to project future cash flows.

- **Appendix F: Review of HUD Analysis of Economic Net Worth, Comparison of HUD and Pinnacle Models, and Assessment of Vulnerabilities** – high-level review of HUD models developed to project Economic Net Worth, comparison of the models developed by HUD with the models developed by Pinnacle, and assessment of the vulnerabilities of the models developed.

- **Appendix G: Summary of Historical and Projected Claim Rates, Non-Claim Termination Rates and Loss Severities** – historical and projected claim, non-claim termination and loss severity rates.

Section 2 - Summary of Findings and Comparison with Fiscal Year 2019 Actuarial Review

This section presents the Economic Net Worth and the details of the Cash Flow NPV of the MMI Forward Loan portfolio as of the end of Fiscal Year 2020, and also shows a comparison of the elements of the Economic Net Worth between the 2019 Actuarial Review and this review.

Economic Net Worth Estimate

The Economic Net Worth is defined as cash available to the Fund plus the Cash Flow NPV of all future cash outflows and inflows that are expected to result from the mortgages currently insured by the MMI. The 2020 Actuarial Review estimates the Cash Flow NPV of the MMI as of the end of Fiscal Year 2020 using data through September 30, 2020. We developed this estimate by analyzing historical loan performance using data provided by FHA, developing predictive models for loan transition and losses, and using these model results along with economic projections from the OMB and Moody's to project future cash flows of the MMI. The NPV of these cash flows along with the MMI's capital resources represent the economic value of the MMI.

The predictive models used in this report are similar conceptually to the models developed in the 2019 Actuarial Review. We have developed binomial logistical models by product type to predict each transition type independently. The binomial model results are then combined in the final simulation to reflect the multiple possible transition outcomes.

Appendices A through G describe the individual models, the assumptions used and the detailed projection model results. Our main findings are as follows.

The Cash Flow NPV is computed from the projected cash flows occurring during Fiscal Year 2021 and subsequent. It is computed based on economic projections associated with the OMB Economic Assumptions. **As of the end of Fiscal Year 2020, Pinnacle estimates that the MMI Cash Flow NPV is $23.397 billion.** The Cash Flow NPV estimate provided by FHA to be used in FHA's Annual Report to Congress is $10.4 billion.

The capital resource available to the MMI is $67.368 billion, which results in an Economic Net Worth of $90.765 billion.

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

Table 6: Cash Flow NPV by Cohort ($ in billions)

Cohort	Pinnacle	FHA	Dollar Difference
1992	0.0	0.0	0.0
1993	0.0	0.0	0.0
1994	0.0	0.0	0.0
1995	0.0	0.0	0.0
1996	0.0	0.0	0.0
1997	0.0	0.0	0.0
1998	0.0	0.0	0.0
1999	0.0	0.0	0.0
2000	0.0	0.0	0.0
2001	0.0	0.0	0.0
2002	-0.1	0.0	0.0
2003	-0.1	-0.1	0.0
2004	-0.2	-0.1	0.0
2005	-0.2	-0.2	0.0
2006	-0.2	-0.2	0.0
2007	-0.3	-0.3	0.0
2008	-0.7	-0.6	0.0
2009	-0.9	-0.8	-0.1
2010	-0.8	-0.6	-0.1
2011	-0.5	-0.3	-0.2
2012	-0.4	-0.2	-0.2
2013	-0.4	0.5	-0.9
2014	1.8	1.4	0.4
2015	3.5	2.3	1.2
2016	4.4	2.9	1.4
2017	4.0	2.7	1.3
2018	1.5	0.8	0.7
2019	2.0	-0.3	2.3
2020	10.9	3.6	7.3

The Pinnacle estimates by cohort are consistent with the FHA estimates through 2007, slighty lower for cohorts 2008 – 2012, increasingly lower for 2013, and higher for cohorts 2014 and 2020. The total Pinnacle Cash Flow NPV estimate is $13.0 billion higher than the FHA estimate, which as a percentage of unamortized IIF is 0.95%. The current unamortized IIF is $1,374 billion. The difference between the Pinnacle and FHA estimate as a percentage of amortized IIF is 1.06%. The current amortized IIF is $1,226 billion.

The housing and economic crisis that occurred in 2008 has resulted in higher claim rates for mortgages originated during Fiscal Years 2005 - 2010. Given that their upfront MIP has already been collected and is included as part of the current capital resources, and due to their large origination volume, the Fiscal Year 2008 - 2010 cohorts are estimated to experience larger negative Cash Flow NPVs than any other cohort. However, at the end of the housing recession, house prices bottomed out and then turned positive, and as a result

mortgages originated in Fiscal Years 2014 - 2020 have positive Cash Flow NPVs. The NPV is also being positively impacted for these more recent cohorts due to MIP now being collected over the life of the mortgage.

Also, the 2020 Cash Flow NPV is influenced by the significant increase in new originations. There has been a significant increase in refinance activity. While this results in a decrease in Cash Flow NPV for older cohorts, it results in an increase in Cash Flow NPV for the 2020 cohort as these loans refinance into the 2020 cohort.

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

Table 7: Cash Flow NPV by Cohort and Product

Cohort	Fixed Rate 30	Fixed Rate 15	Adjustable Rate Mortgage	Total
1992	(357,852)	-	(81,230)	(439,081)
1993	(814,965)	-	(139,304)	(954,269)
1994	(1,763,493)	-	(126,089)	(1,889,582)
1995	(1,221,310)	-	(150,734)	(1,372,044)
1996	(3,484,182)	-	(718,795)	(4,202,977)
1997	(4,733,549)	-	(1,088,038)	(5,821,587)
1998	(9,809,192)	-	(608,777)	(10,417,969)
1999	(15,701,392)	-	(621,549)	(16,322,941)
2000	(12,202,704)	-	(1,000,170)	(13,202,874)
2001	(43,940,995)	-	(1,011,027)	(44,952,022)
2002	(67,738,409)	-	(4,659,137)	(72,397,546)
2003	(105,458,676)	-	(3,103,828)	(108,562,504)
2004	(153,115,135)	-	(10,907,290)	(164,022,425)
2005	(142,173,872)	(1,325)	(12,301,688)	(154,476,885)
2006	(169,227,056)	(11,844)	(5,331,314)	(174,570,213)
2007	(251,514,715)	(183,485)	(3,945,638)	(255,643,837)
2008	(680,655,568)	(452,740)	(7,774,853)	(688,883,160)
2009	(900,599,648)	(1,994,808)	(22,516,389)	(925,110,846)
2010	(742,534,887)	(2,750,023)	(24,883,402)	(770,168,313)
2011	(455,377,470)	(3,701,037)	(25,045,495)	(484,124,002)
2012	(419,389,894)	(5,080,639)	(10,023,225)	(434,493,758)
2013	(361,646,127)	(3,546,396)	(2,036,012)	(367,228,535)
2014	1,829,553,992	8,788,311	10,484,092	1,848,826,395
2015	3,521,353,579	12,561,607	8,071,309	3,541,986,495
2016	4,396,783,295	17,335,597	(15,748,581)	4,398,370,311
2017	3,974,683,339	24,014,332	677,256	3,999,374,927
2018	1,543,437,770	15,894,632	(7,972,574)	1,551,359,828
2019	2,126,299,581	13,702,738	(8,945,348)	2,131,056,971
2020	11,064,193,137	21,174,198	1,339,975	11,086,707,311
Total	23,912,843,600	95,749,119	(150,167,854)	23,858,424,865

The value of the overall Cash Flow NPV is influenced primarily by the fixed rate 30-year mortgage (FRM30) product, which has the largest volume of mortgages historically. The total Cash Flow NPV is positive for the FRM30 and Fixed Rate 15 year (FRM15) products, and is negative for the ARM products.

Change in the Economic Net Worth

Table 8 shows the comparison of our estimate of the MMI's Cash Flow NPV and IIF at the end of Fiscal Year 2020 to the Cash Flow NPV estimate in the 2019 Review.

Table 8: Estimate of Cash Flow NPV as of the end of Fiscal Year 2020 ($ in millions)

Item	2019	2020	Dollar Difference	Percent Change
Cash Flow NPV	18,643	23,397	4,754	25.5%
Capital Resources	54,600	67,368	12,768	23.4%
Economic Net Worth	73,243	90,765	17,522	23.9%
Unamortized Insurance-In-Force	1,363,985	1,373,960	9,975	0.7%

As seen in Table 8, the estimated Fiscal Year 2020 Cash Flow NPV of the MMI has increased by $4.754 billion from the level estimated in Fiscal Year 2019, from $18.643 billion to $23.397 billion. The capital resources available to the MMI have increased by 23.4%, from $54.600 billion to $67.368 billion. The unamortized IIF increased by 0.7% from $1.364 trillion to $1.374 trillion. The change in the Cash Flow NPV represents the net impact of several significant factors, which are described in the next section.

Sources of Change in the Cash Flow NPV from the Fiscal Year 2019 Review

Table 9 provides a summary of the decomposition of changes in the Cash Flow NPV of the MMI as of the end of Fiscal Year 2020 as compared to the Cash Flow NPV in the Fiscal Year 2019 report. The overall net change in the Cash Flow NPV is positive.

Table 9: Changes in Projected Cash Flow NPV

	Change in NPV	Cash Flow NPV - 9/30/20
Baseline FY1992-FY2019		18,642,778,021
Impact of assumption change	-12,151,853,792	6,490,924,229
Impact of model change	9,168,552,903	15,659,477,132
Impact of book change	-3,151,725,013	12,507,752,119
FY1992-FY2019	-6,135,025,902	
FY2020	10,888,930,652	23,396,682,771
Cumulative Change	4,753,904,750	

This section describes the sources of change in estimates of Cash Flow NPV between this year's review and last year's review. Separating out the specific impacts can be done only up to a certain degree of accuracy as the results can vary depending on the order in which the decomposition is done. The interdependency among the various components of the analysis prevents us from identifying and analyzing these as purely independent effects. Given this limitation, this section presents a description of the approximate differences in the Cash Flow NPV from that presented in the Fiscal Year 2019 Review by source of change.

Updated Economic Scenario Forecast

For this decomposition step, we updated the forecasts for the purchase-only HPI and the interest and unemployment rates from 2020 PEA forecast to the 2021 PEA forecast. This step also replaces the projection

used in 2019 Actuarial Review with the actual economic experience for the fourth quarter of 2019 and the first three quarters of 2020. The significant increase in unemployment in 2020 has a negative impact on the projected Cash Flow NPV.

The cumulative result of these economic assumption changes is a decrease of $12.152 billion in the projected Cash Flow NPV.

Updated Predictive Models

With this analysis, we have continued to refine the predictive models to better capture the termination behavior and projected claim amounts of loans in the MMI. We re-estimated the models using updated data and revised variable specifications, and the model assumptions have been adjusted to better reflect the expected ultimate projected claim rates. We have also adjusted our models for the impact of changes to forbearance rules and the economic challenges of COVID-19. For details about these model updates and refinements, refer to Appendices B, C and E. The most significant changes in the model parameters reflect continuing improvements in claim rates, default rates, and ultimate claim amounts.

These model changes led to an increase in estimated economic value in the Cash Flow NPV of $9.169 billion.

Actual Performance of Cohorts 2019 and Prior in Fiscal Year 2020

The actual performance of the MMI 2019 and prior cohorts realized during Fiscal Year 2020 affects the Cash Flow NPV of the MMI estimate of the in-force portfolio. The actual experience for this period was $3.152 billion worse than expected. This is driven in part by the impacts of COVID-19, resulting in increased defaults, increased loss mitigations and increased refinance activity.

Fiscal Year 2020 Origination Volume

The addition of the origination volume for the Fiscal Year 2020 book of business had a positive impact on the NPV. This impact is due in part to the significant increase in volume of refinances. This additional origination volume increased the Cash Flow NPV projection by $10.889 billion.

Section 3 - Cash Flow NPV Based on Alternative Scenarios

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

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

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

Each Moody's scenario produces an estimate of the Cash Flow NPV using future interest, unemployment and HPI rates as a deterministic path. We are including 10 Moody's scenarios in the analysis. These scenarios are consistent with the scenarios used in the 2019 Actuarial Review.

The Moody's scenarios are:

- Baseline
- Alternative 0 – Upside (4th Percentile)
- Alternative 1 – Upside (10th Percentile)
- Alternative 2 – Downside (75th Percentile)
- Alternative 3 – Downside (90th Percentile)
- Alternative 4 – Downside (96th Percentile)
- Slower Trend Growth
- Stagflation
- Next-Cycle Recession
- Low Oil Price

The resulting Cash Flow NPV associated with each alternative scenario is summarized in Table 10. Below, we discuss the characteristics of each Moody's scenario.

Baseline Scenario

In the Baseline scenario, the HPI is flat through the third quarter of 2021, and then increases over the remainder of the projection period. The rate of increase is just under 5% per year through 2029, and then decreases to about 3% per year for the remainder of the projection period. The mortgage interest rate decreases to about 3% through the second quarter of 2021 and then increases through 2028. The mortgage rate levels off at approximately 5.5% by 2029. The unemployment rate is projected to decrease through 2023 to approximately 4.5%, and then remain steady at that level for the remainder of the projection period. Under this scenario, it is

projected that it will take approximately three years for unemployment to fully return to more stable levels, and it is projected to stabilize at a level higher than pre-COVID-19 unemployment levels.

Alternative Scenario 0 – Upside (4th Percentile)

In the Alternative Scenario 0 – Upside (4th Percentile), the HPI is projected to increase throughout the entire projection period. The rate of increase is about 4 - 5% per year through 2029, and then decreases to about 3% per year for the remainder of the projection period. The mortgage interest rate increases through 2027, then levels off at approximately 5.4% for the remainder of the projection period. The unemployment rate is projected to decrease through 2024 to approximately 3.6%, and then increase gradually until it stabilizes at approximately 4.5%. Under this scenario, unemployment recovers to better than pre-COVID-19 levels over the next three years.

Alternative Scenario 1 – Upside (10th Percentile)

In the Alternative Scenario 1 – Upside (10th Percentile), the HPI is projected to increase throughout the entire projection period. The rate gradually increases from 2.5% per year in the first quarter of 2022 to 5% per year by the second quarter of 2023. The rate then decreases to about 3% per year for the remainder of the projection period. The mortgage interest rate increases for the entire projection period, leveling off at approximately 5.4% by 2026. The unemployment rate is projected to decrease through 2024 to approximately 3.8%, and then increase gradually until it stabilizes at approximately 4.5%. Under this scenario, unemployment recovers to pre-COVID-19 levels over the next three years.

Alternative Scenario 2 – Downside (75th Percentile)

In the Alternative Scenario 2 – Downside (75th Percentile), the HPI decreases though the fourth quarter of 2021, and then increases throughout the remainder of the projection period. Mortgage interest rates are projected to decrease through the second quarter of 2021, and then increase through 2027. Mortgage rates level off for the remainder of the projection period at approximately 5.4%. The unemployment rate is projected to decrease slowly to 4.5% by 2024. Under this scenario, the recovery in the unemployment rate occurs over a longer period, and is projected to stabilize at a level higher than pre-COVID-19 unemployment levels.

Alternative Scenario 3 – Downside (90th Percentile)

In the Alternative Scenario 3 – Downside (90th Percentile), the HPI decreases through the first quarter of 2022, and then begins to increase. Mortgage interest rates decrease through the third quarter of 2021, and then begin to increase until they reach the long-term average of about 5.4%. The unemployment rate increases to 10.8% in 2021, then decreases to 4.9% by the end of 2026. Under this scenario, the recovery in the unemployment rate occurs over a longer period, and is projected to stabilize at a level higher than pre-COVID-19 unemployment levels.

Alternative Scenario 4 – Downside (96th Percentile)

In Alternative Scenario 4 – Downside (96th Percentile), the HPI decreases through the second quarter of 2022, and then begins to increase. Mortgage interest rates drop through the fourth quarter of 2021, and then begin to

slowly increase until they reach the long-term average of 5.4% in 2029. The unemployment rate spikes to 12% by 2022, and then decreases to 4.9% by 2031. Under this scenario, the recovery in the unemployment rate occurs over a longer period, and is projected to stabilize at a level higher than pre-COVID-19 unemployment levels.

Slower Trend Growth

In the Slower Trend Growth scenario, the HPI increases more slowly than in the Baseline scenario. Mortgage interest rates decrease to 2.9% by the second quarter of 2021, and then settle at a long-term average of 5.0%. The unemployment rate decreases to 4.9% by 2024. Under this scenario, the recovery in the unemployment rate occurs over a longer period, and is projected to stabilize at a level higher than pre-COVID-19 unemployment levels.

Stagflation

In the Stagflation scenario, the HPI decreases through the third quarter of 2022, and then begins to increase. Mortgage interest rates increase to 3.5% by the first quarter of 2021, and then drop through the fourth quarter of 2021. Mortgage interest rates then begin to increase to the long-term average of 5.4%. Unemployment rates decrease to 8.8% by the end of 2020, and then increase to 10.1% by the second quarter of 2021. Unemployment rates then decrease to a long-term average of 4.9% by 2026.

Next-Cycle Recession

In the Next-Cycle Recession scenario, the HPI increases through the first quarter of 2022, and then decreases significantly through the third quarter of 2024. The HPI then increases for the remainder of the projection period. The mortgage interest rates increase through the fourth quarter of 2022, and then decrease through the fourth quarter of 2023. The rates then settle in at a long-term average of about 5.4%. The unemployment rate is equal to the Baseline assumptions through the second quarter of 2022, and then increases to 7.8% by the end of 2023. The rate then decreases to 4.5% by 2034, where it remains for the remainder of the projection period.

Low Oil Price

In the Low Oil Price scenario, the HPI increases throughout the entire projection period, similar to the Baseline scenario. Mortgage interest rates decrease to 2.7% by the second quarter of 2021, and then increase to 5.8% by 2027. The mortgage rate then decreases gradually through the remainder of the projection period. Unemployment rates decrease through the fourth quarter of 2023, and then increase gradually to a long-term average of 4.5%.

Summary of Alternative Scenarios

Table 10 shows the projected Cash Flow NPV from the 11 deterministic scenarios. The range of projected results is between negative $18.993 billion and positive $23.397 billion.

Table 10: Cash Flow NPV Summaries from Alternative Scenarios

Cohort	Pinnacle ACE	Baseline	Alternative 0 – Upside (4th Percentile)	Alternative 1 – Upside (10th Percentile)	Alternative 2 – Downside (75th Percentile)	Alternative 3 – Downside (90th Percentile)	Alternative 4 – Downside (96th Percentile)	Slower-Trend Growth	Stagflation	Next-Cycle Recession	Low Oil Price
1992	-348,460	-648,848	-352,641	-418,546	-655,138	-570,573	-753,996	-640,623	-427,011	-782,392	-599,121
1993	-1,160,429	-1,641,309	-804,291	-1,223,154	-1,813,742	-2,134,182	-2,526,301	-1,616,900	-2,088,079	-1,715,591	-1,215,603
1994	-1,915,290	-3,200,205	-1,289,654	-2,570,084	-3,752,078	-4,298,142	-5,593,574	-3,011,993	-4,061,086	-3,523,820	-3,135,095
1995	-1,435,867	-3,345,439	-1,547,001	-2,756,001	-4,156,746	-3,397,446	-4,060,881	-3,946,279	-3,083,563	-4,331,916	-3,144,783
1996	-3,362,930	-7,475,774	-3,494,661	-5,585,264	-6,684,724	-8,975,147	-11,299,129	-7,921,433	-7,200,386	-8,480,563	-7,106,914
1997	-6,759,911	-10,373,901	-5,427,475	-7,214,633	-11,816,491	-13,647,901	-16,150,162	-11,056,101	-12,557,399	-12,310,906	-11,501,223
1998	-10,775,983	-20,099,777	-10,715,992	-15,319,848	-22,626,231	-24,855,094	-31,401,145	-22,602,922	-23,045,205	-21,963,464	-20,958,950
1999	-14,869,717	-28,826,012	-12,986,980	-20,520,356	-34,530,836	-33,605,057	-40,738,443	-34,243,748	-32,673,878	-32,023,370	-29,049,189
2000	-13,245,634	-23,032,688	-13,534,865	-17,741,990	-26,951,372	-28,400,348	-35,550,197	-25,527,044	-27,320,456	-28,087,539	-25,539,614
2001	-46,115,845	-67,388,042	-44,463,335	-57,188,375	-76,313,326	-80,771,952	-92,531,506	-73,919,731	-73,851,594	-71,888,651	-69,735,324
2002	-69,343,144	-100,895,733	-69,164,994	-85,293,540	-111,694,065	-120,580,632	-148,451,651	-106,005,362	-115,501,048	-105,542,859	-102,826,041
2003	-106,768,867	-148,193,793	-101,805,066	-124,279,286	-168,288,007	-186,696,949	-236,159,244	-164,155,075	-179,101,039	-162,560,228	-153,215,840
2004	-163,750,202	-238,048,860	-170,863,484	-198,489,886	-257,493,349	-284,550,253	-347,647,999	-259,551,116	-274,829,872	-252,466,322	-245,705,319
2005	-156,305,021	-232,686,022	-158,830,227	-191,443,437	-251,130,829	-277,944,590	-334,837,348	-254,350,892	-269,862,843	-253,264,668	-244,368,000
2006	-173,081,954	-253,358,029	-177,971,332	-205,876,476	-263,395,489	-285,876,199	-329,381,867	-270,924,834	-283,306,294	-260,429,798	-253,519,477
2007	-255,907,972	-375,642,778	-267,135,056	-314,879,133	-401,161,898	-418,127,046	-477,102,446	-400,804,983	-410,422,291	-392,386,355	-377,699,848
2008	-669,157,326	-961,104,788	-704,487,625	-806,818,474	-1,026,399,601	-1,118,228,901	-1,287,932,150	-1,055,968,242	-1,093,220,948	-1,031,121,486	-970,325,035
2009	-918,788,943	-1,248,854,720	-864,698,522	-1,022,694,188	-1,288,432,843	-1,458,294,733	-1,706,927,364	-1,309,796,782	-1,302,158,660	-1,351,975,548	-1,203,591,190
2010	-776,487,875	-1,030,353,623	-725,226,777	-872,259,201	-1,110,436,672	-1,202,457,193	-1,444,542,742	-1,165,445,253	-1,141,915,013	-1,073,619,344	-1,056,607,047
2011	-503,559,927	-646,768,804	-456,364,706	-510,221,708	-700,562,748	-784,796,826	-1,023,443,426	-757,363,797	-742,929,967	-703,869,292	-678,720,171
2012	-447,634,443	-673,570,725	-418,413,129	-511,350,735	-784,531,586	-942,627,918	-1,184,828,811	-765,158,901	-818,842,913	-735,319,470	-735,190,821
2013	-387,410,293	-830,504,848	-272,239,654	-441,488,478	-983,919,524	-1,397,556,865	-1,818,670,219	-968,252,571	-1,125,752,174	-963,778,965	-833,014,559
2014	1,831,341,873	1,282,736,242	1,720,389,697	1,511,848,610	1,170,356,748	849,945,230	470,857,913	1,014,790,872	1,144,369,279	1,148,872,588	1,180,487,235
2015	3,463,919,332	2,183,484,181	3,120,528,409	2,704,672,261	1,745,148,589	1,026,046,646	135,809,331	1,441,738,082	1,629,341,850	1,778,572,788	1,731,776,190
2016	4,365,037,310	2,008,339,131	3,544,681,256	2,840,556,439	1,300,300,662	300,598,503	-899,924,897	1,238,686,766	1,433,752,837	1,588,934,552	1,704,602,146
2017	4,000,572,745	908,930,608	3,167,237,022	2,046,642,819	225,137,935	-952,261,615	-2,358,464,241	110,922,546	53,765,483	472,364,889	717,148,828
2018	1,533,469,469	-743,840,439	1,214,815,815	230,712,843	-1,522,724,030	-2,320,507,071	-3,506,232,692	-1,822,895,632	-1,632,735,361	-1,310,344,833	-986,399,686
2019	2,041,597,422	-720,373,521	1,313,835,166	273,019,311	-1,470,942,484	-2,393,482,158	-3,667,822,960	-1,815,944,121	-1,686,472,996	-1,452,881,532	-1,143,332,939
2020	10,888,930,652	7,096,067,391	10,306,253,638	8,743,295,803	5,720,241,638	3,560,114,896	1,413,145,707	5,930,688,125	5,738,569,404	6,211,501,871	6,293,051,596
Total	23,396,682,771	5,109,328,875	19,905,923,534	12,935,115,293	-369,228,238	-8,607,939,515	-18,993,162,441	-1,564,277,946	-1,263,561,223	965,577,777	2,470,564,208

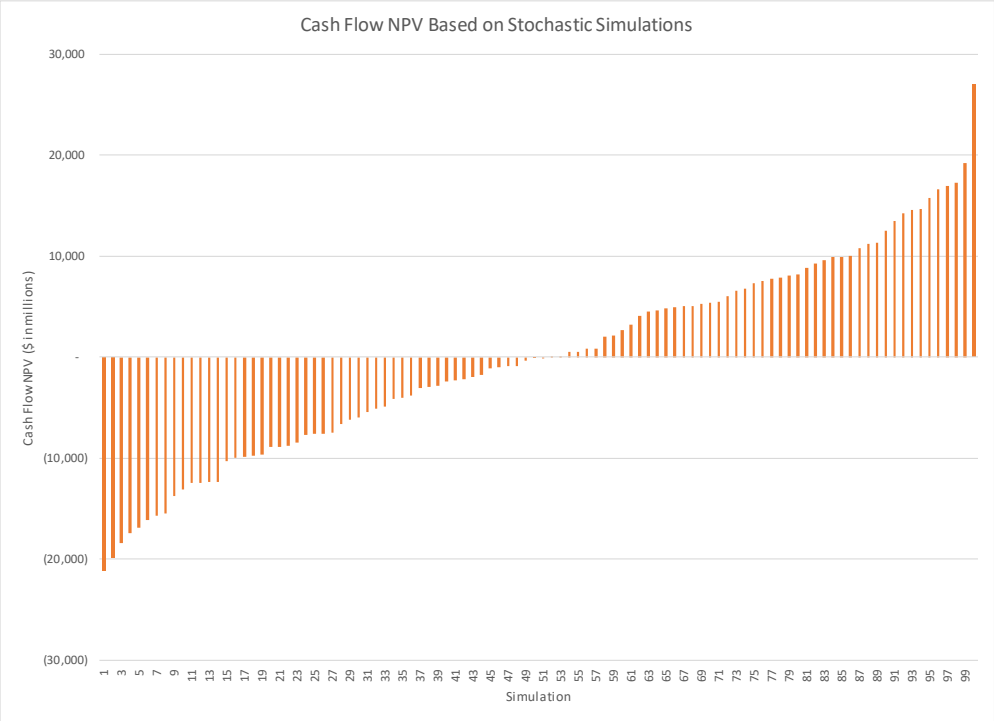
The Pinnacle ACE is based on the PEA, which were developed in 2019 prior to the impacts of COVID-19 on the economy. The Moody's projections incorporate the effects of COVID-19. This has the effect of assuming an immediate economic recovery for the PEA, whereas the Moody's scenarios project an economic recovery over a longer period. As a result, the NPV projection based on the PEA is significantly higher than the Moody's Baseline projection.

Stochastic Simulation

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

Figure 9 below shows the range of Cash Flow NPV resulting from the 100 simulated scenarios.

Figure 9: Stochastic Simulation Results



Based on the stochastic simulation results, the range of Cash Flow NPV estimates is negative $21.162 billion to positive $26.989 billion.

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

The Cash Flow NPV estimate provided by FHA to be used in the FHA Annual Report to Congress is $10.4 billion. Based on Pinnacle's ACE and range estimates, we conclude that the FHA estimate of Cash Flow NPV is reasonable.

Sensitivity Tests of Economic Variables

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

- Interest rates, including:
    - 10-year CMT rate
    - One-year CMT rate

  - Commitment rate on 30-year fixed-rate mortgages
- Unemployment Rate

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

Figure 10 shows the sensitivity of the Cash Flow NPV with respect to changes in future interest rates. Specifically, we applied parallel shift to the one-year CMT rate, 10-year CMT rate and the mortgage rates up and down from the Baseline scenario by 20, 50, 100 and 200 basis points. Interest rates are not allowed to be negative. The results show a positive slope, indicating that the Cash Flow NPV of the MMI is positively related to future interest rates. Higher future interest rates benefit the MMI in two ways. First, a higher future interest rate means lower refinance incentive for existing borrowers. Thus, there would be fewer prepayments, which lead to a longer stream of annual MIP revenue. Second, higher future interest rates imply that the mortgage payments of existing borrowers would be lower than that of a new mortgage with the market interest rate. The below-market mortgage payment serves as an incentive for borrowers to keep their mortgages longer and thus is a disincentive to default in order to continue to benefit from their below-market payments. A 100 basis point fall in interest rates will incur a decrease in Cash Flow NPV of $6.291 billion, and a positive 100 basis point change in interest rates will result in an increase in Cash Flow NPV of $3.364 billion. For the interest rate sensitivity, the range of Cash Flow NPV impacts are -0.97% to +0.31% of IIF, as shown in Figure 11.

Figure 10 also reports the sensitivity of the Cash Flow NPV with respect to the unemployment rate. The results show a negative slope, indicating that the Cash Flow NPV of the MMI is negatively related to future unemployment rates. A negative 100 basis point change in the unemployment rates will produce an increase in Cash Flow NPV of positive $7.013 billion, and a positive 100 basis point change in the unemployment rate will result in a decrease in Cash Flow NPV of $8.783 billion. This results from the fact that as unemployment increases, the likelihood of defaults and claims increase, and the average net loss increases as well. For the unemployment rate sensitivity, the range of Cash Flow NPV impacts are -1.18% to +0.64% of IIF, as shown in Figure 11.

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

Figure 10: Sensitivity Test of Selected Economic Variables

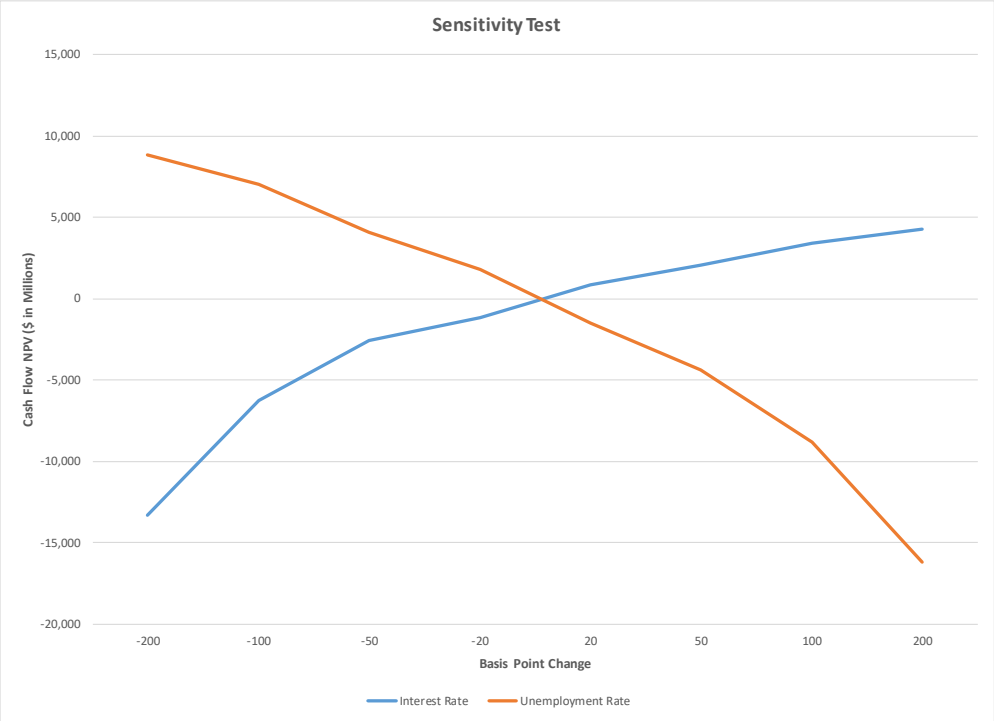
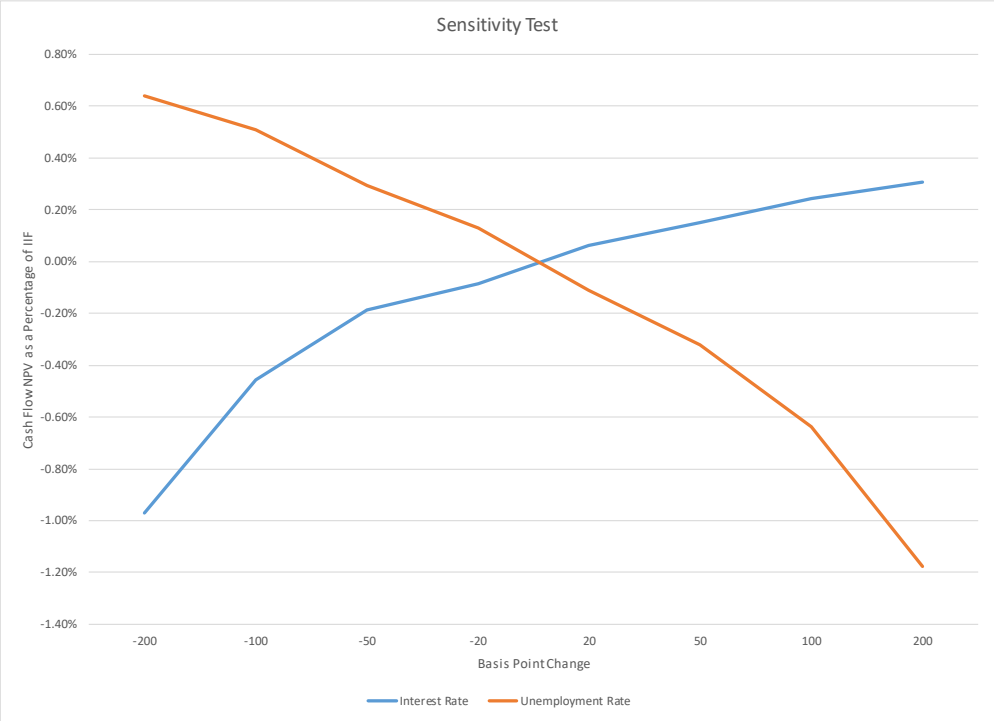


Figure 11: Sensitivity Test of Selected Economic Variables as a Percentage of IIF



Section 4 - Characteristics of the Fiscal Year 2020 Insurance Portfolio

This section analyzes the characteristics of the loan portfolio insured by the MMI as of Fiscal Year 2020. This discussion covers the following three areas:

1. analysis of the volume and composition of loan types,
2. comparison of new purchase loans versus refinances and
3. the distribution of loans by loan characteristics.

This section also examines and compares the 2020 cohort with previous cohorts in order to determine how the 2020 cohort is likely to influence the future performance of the MMI.

Volume and Share of Mortgage Originations

FHA insured $304 billion in single-family forward mortgages in Fiscal Year 2020, bringing the MMI's total unamortized IIF to $1.374 trillion. This represents an increase of 41.6% above the volume insured in Fiscal Year 2019.

Table 11 shows FHA's origination count and volume by cohort. The new purchase count dropped significantly from Fiscal Year 2003 to Fiscal Year 2007, increased dramatically through Fiscal Year 2010, then returned to levels similar to those in Fiscal Years 2001 - 2003. The decline and subsequent rise were due to the Government Sponsored Enterprise (GSE)[59] and non-conforming lenders aggressive marketing strategies during the subprime era and their capital limitations when the housing market crashed. The capital impairment of the private mortgage insurance companies also contributed to FHA's rising volume after the crash. As the private mortgage insurance industry faced severe capital constraints, the GSEs had been unable to purchase or guarantee loans with less than a 20% down payment. FHA became the primary source of high LTV loans after Fiscal Year 2008. Private mortgage insurance companies have begun underwriting more policies during the past eight years.

The volumes show a similar pattern, for the same reasons cited above, but the volumes subsequent to the housing crisis were much higher than volumes in the early 2000s. The loan size limits were increased to the levels of the GSEs, making more loans eligible for FHA insurance. The private mortgage insurers and non-conforming lenders faced capital constraints, making FHA the only feasible channel for high LTV loans.

In Fiscal Year 2020, the new purchase counts increased by 7.8%, while the fully underwritten refinances increased by 1.1% and the streamline refinances increased by 440%. The new purchase volume increased by 15.6%, the fully underwritten refinance volume increased by 6.2% and the streamline refinance volume increased by 421%. The drop in interest rates due to the economic crisis has led to a substantial increase in refinance activity, and the implementation of shelter-in-place orders and the closing of physical offices has led to a dramatic increase in the volume of streamline refinance activity. This level of increase in refinance activity is similar to the refinance volume increase seen during the economic crisis of 2008 and 2009.

[59] Fannie Mae, Freddie Mac and the Federal Home Loan Banks

Table 11: Total Count and Volume of FHA-Insured Originations

	Count of Originations				Volume of Originations ($ Billions)		
Cohort	New Purchase	Fully Underwritten Refinance	Streamline Refinance		New Purchase	Fully Underwritten Refinance	Streamline Refinance
1985	340,286	7	45		20.19	0.00	0.00
1986	737,217	18	7,023		45.56	0.00	0.43
1987	1,119,343	21	143,403		69.83	0.00	9.08
1988	670,354	2	42,198		40.95	0.00	2.60
1989	557,895	3	16,287		34.85	0.00	0.97
1990	689,946	127	27,516		45.25	0.01	1.69
1991	629,189	464	27,063		42.87	0.03	1.74
1992	524,680	1,889	72,353		37.19	0.13	4.88
1993	537,868	12,251	300,984		39.99	0.89	21.78
1994	652,711	16,968	549,688		51.84	1.21	38.70
1995	476,712	4,298	41,917		38.08	0.32	2.83
1996	590,486	27,110	91,107		49.85	2.22	7.44
1997	629,615	28,624	43,590		54.82	2.44	3.82
1998	742,465	54,577	174,645		68.04	5.02	17.41
1999	831,805	73,511	258,376		80.86	7.17	25.14
2000	763,063	36,640	31,843		79.40	3.83	3.04
2001	730,105	59,782	172,664		79.71	6.85	20.99
2002	787,093	87,444	293,642		91.02	10.64	34.47
2003	602,452	94,268	522,214		73.03	12.12	62.17
2004	540,314	77,985	274,123		66.84	10.28	30.51
2005	328,543	42,858	106,952		40.20	5.87	11.91
2006	293,257	72,064	34,585		37.10	10.65	3.98
2007	261,166	120,291	20,887		35.00	18.51	3.00
2008	591,326	376,522	63,733		95.37	65.78	10.65
2009	995,101	506,822	329,395		171.67	92.90	65.82
2010	1,109,164	344,877	212,871		191.60	62.61	43.29
2011	777,101	239,344	180,227		134.36	44.36	38.92
2012	733,700	176,767	274,033		124.45	31.83	56.99
2013	702,415	130,588	511,842		124.93	24.07	91.11
2014	594,998	76,315	115,038		105.72	13.19	16.31
2015	753,387	130,032	232,811		140.26	24.75	48.11
2016	879,511	165,506	213,030		171.63	32.14	41.64
2017	882,077	200,259	164,099		178.62	40.54	31.79
2018	776,275	185,815	52,510		160.89	38.10	10.06
2019	743,279	189,212	57,934		159.37	40.54	14.72
2020	800,986	191,322	312,977		184.26	43.03	76.64

Table 12 shows FHA's origination volume and market share in home purchase mortgages from Calendar Year 2001 through Calendar Year 2020.

Table 12: FHA's Market Share in the Home Purchase Mortgage Market

	Volume of Home Sales ($ Billions)		
Calender Year	FHA	Market	FHA Share (%)
2001	89	958	9.3%
2002	82	1,096	7.5%
2003	71	1,273	5.6%
2004	53	1,306	4.1%
2005	37	1,506	2.5%
2006	36	1,401	2.5%
2007	39	1,142	3.5%
2008	129	741	17.5%
2009	185	653	28.3%
2010	167	539	31.0%
2011	129	503	25.7%
2012	127	598	21.2%
2013	119	731	16.3%
2014	107	762	14.0%
2015	154	896	17.2%
2016	176	1,049	16.7%
2017	174	1,140	15.2%
2018	158	1,207	13.1%
2019	170	1,270	13.4%
2020	135	963	14.0%

Sources: FHA Volume from FHA Data Warehouse, September 30, 2020 extract. Market volume from Mortgage Bankers Association. Calendar year 2020 includes data through September 30, 2020.

FHA's market share declined to a low of 2.5% in 2005. This trend reversed during the next several years and by Fiscal Year 2010, FHA's market share was up to 31.0%. Subsequently, the market share decreased through 2011. The FHA share has increased since 2019, and for the first nine months of Calendar Year 2020 is 14.0%.

Originations by Location

FHA insures loans in all regions of the United States, but over half of FHA's total dollar volume is concentrated in ten states. Table 13 shows the percentage of FHA's total dollar volume originated in these ten states from Fiscal Year 2013 through Fiscal Year 2020. The states are ordered based on the dollar volume endorsed during Fiscal Year 2020.

Table 13: Percentage of Mortgage Origination Volume in the Top 10 States

	Fiscal Year							
State	2013	2014	2015	2016	2017	2018	2019	2020
California	17.1%	16.3%	18.8%	17.5%	16.8%	14.7%	14.3%	14.4%
Texas	7.1%	8.9%	7.3%	7.5%	7.6%	8.0%	8.3%	9.4%
Florida	4.8%	6.0%	6.0%	6.8%	7.5%	8.5%	8.9%	8.9%
Georgia	3.1%	3.4%	3.2%	3.7%	3.7%	4.0%	4.0%	4.1%
New Jersey	3.5%	3.1%	3.5%	3.4%	3.5%	3.5%	3.5%	3.7%
Colorado	3.5%	3.1%	3.6%	3.6%	3.5%	3.3%	3.3%	3.6%
Maryland	3.3%	3.2%	3.4%	3.3%	3.5%	3.5%	3.7%	3.5%
Arizona	2.9%	3.5%	3.7%	3.4%	3.2%	3.1%	3.2%	3.4%
New York	3.1%	2.6%	3.0%	3.1%	3.0%	3.0%	3.0%	3.0%
Washington	3.4%	3.3%	3.1%	3.1%	3.2%	3.2%	3.0%	3.0%

Currently, loans in California comprise the largest percentage of all FHA loans based on dollar volume, which is 14.4%. The percentage of loan volume in California had been decreasing from 2015 – 2019, but increased slightly in 2020. Texas is now the second largest state again in 2020, after dropping to third in 2018. The percentage of loan volume in Florida has increased by 4.1% since 2013. Florida passed Texas in 2018, but a significant surge in origination volume in Texas in 2020 has caused Florida to drop back to third place.

Originations by Product

Table 14 shows that the fully underwritten 30-year FRM has comprised the majority of FHA's single-family business, representing a dollar-weighted average share of approximately 75.5% of the business over Fiscal Years 1986 - 2020. The share of total mortgages represented by 30-year FRMs began to change in the early 1990s when FHA started insuring ARMs and streamline refinancing mortgages (SRs). For the next few years, ARM and SR mortgages gradually assumed a larger share of annual loan originations and the 30-year FRM share decreased. The 1993 and 1994 cohorts recorded the lowest shares of 30-year FRMs. An opposite trend emerged from Fiscal Year 2003 through Fiscal Year 2007, in which 30-year FRM endorsements increased from 52.4% to 92.1%, while 30-year SR endorsements dropped from 36.0% to 5.1%. However, the share of 30-year FRMs in Fiscal Year 2009 through Fiscal Year 2013 dropped from 77.1% to 58.3%. From this point, the percentage increased to 91.8% in Fiscal Year 2019. In Fiscal Year 2020, the percentage of 30-year FRMs has dropped to 74.3%.

The ARM share of the portfolio, including SR ARMs, shrank dramatically from 12.0% in Fiscal Year 2005 to 1.1% in Fiscal Year 2009. It subsequently rose to 6.0% in Fiscal Year 2011, and then has decreased since then. ARMs account for only 0.04% of the endorsements in the 2020 cohort. The drop in the ARM share and the virtual non-existence in 2020 has been related to the low interest rates. The 15-year FRMs increased from 1.2% in Fiscal Year 2007 to 6.4% in Fiscal Year 2012, but have declined in the last six years and are at 0.4% in Fiscal Year 2020. The 15-year SR continues to be a minor product type in the MMI.

Table 14: Percentage of Origination Volume by Mortgage Product

	Fully Underwritten Mortgages			Streamline Refinance		
Fiscal Year	30-Year FRM	15-Year FRM	ARMs	30-Year SRs	15-Year SRs	ARMs SRs
1986	89.88	8.30	0.88	0.80	0.15	0.00
1987	81.83	5.52	1.15	9.85	1.61	0.05
1988	85.55	3.99	4.50	5.27	0.66	0.03
1989	92.82	2.70	1.76	2.55	0.17	0.00
1990	92.91	2.79	0.70	3.33	0.26	0.00
1991	89.52	3.13	3.45	3.37	0.50	0.02
1992	70.24	2.62	15.57	8.75	1.71	1.11
1993	49.91	2.21	13.11	26.43	6.46	1.87
1994	40.92	1.83	15.07	30.66	8.75	2.77
1995	62.66	1.54	28.93	4.43	1.62	0.82
1996	62.29	1.32	23.89	8.98	1.74	1.77
1997	61.57	1.19	30.98	3.64	0.81	1.80
1998	60.20	1.09	19.46	15.35	1.21	2.68
1999	73.04	1.14	3.61	19.48	1.79	0.95
2000	84.29	0.73	11.45	2.50	0.35	0.67
2001	77.30	0.90	2.28	18.37	0.58	0.57
2002	68.13	1.19	5.36	21.11	1.48	2.73
2003	52.38	1.31	4.11	35.97	2.92	3.32
2004	62.19	1.37	8.10	21.49	2.60	4.26
2005	69.14	1.26	9.06	16.17	1.41	2.96
2006	88.10	1.36	2.85	6.96	0.48	0.25
2007	92.13	1.22	1.33	5.12	0.11	0.07
2008	90.78	1.61	1.42	5.91	0.14	0.15
2009	77.11	2.18	0.79	19.26	0.37	0.29
2010	78.99	3.63	2.83	13.16	0.36	1.02
2011	72.29	5.64	4.19	15.46	0.62	1.80
2012	65.41	6.38	1.49	24.54	1.18	1.00
2013	58.28	3.08	0.69	36.59	0.96	0.39
2014	82.47	2.51	2.96	11.01	0.37	0.68
2015	74.46	1.67	1.30	21.93	0.19	0.45
2016	81.14	1.34	0.55	16.66	0.25	0.06
2017	85.65	1.27	0.40	12.30	0.36	0.00
2018	93.58	1.13	0.48	4.66	0.14	0.01
2019	91.81	0.90	0.44	6.78	0.07	0.00
2020	74.31	0.44	0.04	25.08	0.13	0.00
1986-2020	75.49	2.24	3.90	16.58	0.93	0.86

Initial Loan to Value Distributions

Based on 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 the complement of the borrower's equity at origination. Table 15 shows the distribution of mortgage originations by original LTV categories.

Table 15: Percentage of Origination Volume by Original LTV Category

Cohort	Unknown	≤ 80%	> 80% ≤ 90%	> 90% ≤ 95%	> 95% < 97%	≥ 97
1986	0.67%	17.98%	30.59%	27.02%	20.75%	2.99%
1987	0.23%	18.27%	29.17%	27.97%	21.24%	3.12%
1988	0.08%	10.15%	21.72%	33.84%	29.51%	4.70%
1989	0.43%	7.58%	18.46%	35.95%	32.36%	5.22%
1990	20.77%	5.90%	14.77%	28.84%	25.63%	4.08%
1991	3.42%	5.99%	16.06%	30.32%	29.59%	14.61%
1992	10.92%	4.52%	13.29%	24.87%	33.23%	13.17%
1993	27.25%	3.73%	11.22%	19.57%	23.24%	15.00%
1994	34.40%	3.56%	9.67%	16.38%	19.79%	16.20%
1995	5.64%	3.15%	10.39%	22.94%	31.68%	26.21%
1996	9.48%	2.97%	10.55%	23.07%	30.84%	23.09%
1997	4.55%	3.41%	11.29%	24.94%	32.49%	23.31%
1998	13.34%	3.62%	11.76%	23.29%	29.09%	18.89%
1999	12.89%	4.00%	10.94%	14.77%	25.17%	32.23%
2000	1.44%	2.66%	6.86%	7.26%	31.89%	49.89%
2001	9.52%	3.61%	8.77%	8.63%	22.75%	46.71%
2002	0.27%	4.67%	11.08%	9.99%	23.74%	50.25%
2003	0.00%	6.03%	12.57%	11.73%	23.67%	45.99%
2004	0.00%	6.56%	11.70%	10.33%	22.46%	48.94%
2005	0.01%	6.39%	10.72%	9.06%	22.17%	51.65%
2006	0.01%	7.12%	10.72%	14.35%	19.89%	47.91%
2007	0.01%	7.38%	11.68%	21.24%	18.20%	41.50%
2008	0.14%	6.18%	12.18%	24.03%	14.11%	43.35%
2009	0.01%	4.99%	13.33%	18.82%	35.68%	27.17%
2010	0.01%	4.81%	14.53%	12.63%	58.79%	9.24%
2011	0.01%	4.86%	14.80%	14.07%	59.89%	6.37%
2012	0.01%	5.50%	13.45%	20.00%	57.17%	3.87%
2013	0.01%	5.66%	16.15%	27.25%	48.60%	2.34%
2014	0.01%	6.07%	14.09%	12.92%	65.04%	1.86%
2015	0.01%	6.06%	14.84%	12.95%	63.83%	2.30%
2016	0.01%	6.86%	16.11%	11.14%	64.12%	1.75%
2017	0.02%	7.84%	17.19%	10.08%	63.65%	1.23%
2018	0.02%	7.80%	16.81%	8.10%	66.16%	1.11%
2019	0.02%	7.57%	17.45%	7.76%	65.45%	1.74%
2020	0.01%	10.51%	12.12%	12.20%	62.66%	2.50%

The distribution among original LTV categories shifted significantly after Fiscal Year 1998. Almost half of the loans insured during from Fiscal Year 2000 to Fiscal Year 2006 had LTVs greater than or equal to 97%. This concentration in the highest risk category gradually declined during the next few years. In 2008, MMI placed a limit of 96.5% on original LTV, with no additional allowance for the financing of closing costs. During Fiscal Year 2009, 27.2% of mortgages had LTV ratios of 97% or more. In Fiscal Years 2010 - 2018, this concentration continued to decline, but has increased in Fiscal Years 2019 and 2020 to 2.5%. Since Fiscal Year 2014, over 60% of mortgages have LTV ratios between 95 to 97%.

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

for the local house price index and amortization, as a proxy for this variable.

The LTV position of cash-out refinances has also been an issue of concern for HUD. The share of cash-out refinances had increased significantly through the mid-2000's, however as the housing market weakened in the late 2000's, this was shown to have contributed to an increase in the number of foreclosures. In response, FHA decreased the LTV requirement for cash out refinances from 95% to 85% in 2009. FHA data shows that the number of cash out refinances is increasing significantly again, and as a result in 2019 decreased the LTV requirement again from 85% to 80% effective September 1, 2019.[60]

Borrower Credit History Distribution

Credit score data has been collected from two different sources. The first source includes credit scores collected for a sample of FHA applications from Fiscal Years 1992, 1994, and 1996, and subsequently extended to loan applications during Fiscal Years 1997 - 2004. This 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 loans that defaulted early among applications over Fiscal Years 1997 - 2004.

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

Table 16 shows the distribution of fully underwritten FHA mortgage loans by borrower credit score categories and cohort. The distribution among credit score categories remained relatively stable for the 2005 - 2008 cohorts. For loans originated after Fiscal Year 2008, the credit score distribution showed significant improvement over the previous years. Approximately 39% of the Fiscal Year 2020 loans have credit scores above 680. Loans with credit scores below 600 are only 3.4% of the loans originated in Fiscal Year 2020, which is substantially lower than in the Fiscal Year 2007 book, where 32.8% of the loans had credit scores below 600. However, despite the distributions having improved since 2007, the trend in credit scores from 2012 through 2019 is concerning. The proportion of loans with credit scores below 600 has been increasing slowly from 2012 through 2019, rising from 0.6% to 5.2%. Also, the proportion of loans with credit scores above 680 has decreased from 2016 through 2019 from 46.0% to 34.5%. In Fiscal Year 2020, the percentage of loans with credit scores below 600 decreased to 3.4%, and the percentage with scores of 680 or higher increased to 38.5%. If the previous deterioration in credit scores continues, it could result in worse default and loss experience, and thus

[60] Mortgagee Letter 2019-11, August 1, 2019: Maximum Loan-To-Value and Combined Loan-To-Value Percentages for Cash-out Refinance Mortgages.

would contribute negatively to the economic value of the MMI for the more recent cohorts.

In the predictive models, we also controlled for missing and uncollected credit scores. In Table 16, the category "Missing" refers to loans with insufficient borrower credit history to generate a credit score, and the category "Not Collected" refers to loans where no attempt was made to obtain the credit score for some of the Fiscal Year 2004 and earlier loans. These categories have been combined in the table. Since credit scores became a requirement for fully underwritten loans, the Missing/Not Collected category has been a negligible percentage of the overall book.

Table 16: Percentage of Origination Volume by Credit Score for Fully Underwritten Loans

Cohort	Missing / Not Collected	300-499	500-559	560-599	600-639	640-679	680-850
1997	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1998	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1999	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2000	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2001	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2002	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2003	99.96%	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%
2004	75.76%	0.20%	2.20%	4.19%	6.21%	5.23%	6.22%
2005	6.86%	0.90%	9.24%	16.70%	24.18%	19.89%	22.22%
2006	4.81%	0.94%	8.75%	16.61%	24.50%	20.70%	23.69%
2007	4.18%	1.53%	11.76%	19.47%	25.09%	18.93%	19.04%
2008	2.21%	0.83%	6.93%	14.09%	24.21%	22.71%	29.03%
2009	1.03%	0.05%	1.13%	5.10%	18.01%	24.83%	49.86%
2010	1.06%	0.01%	0.16%	0.86%	12.39%	25.02%	60.51%
2011	0.89%	0.00%	0.07%	0.48%	8.40%	27.11%	63.05%
2012	0.52%	0.00%	0.09%	0.52%	8.23%	30.77%	59.87%
2013	0.44%	0.00%	0.08%	0.43%	6.50%	36.42%	56.14%
2014	0.27%	0.00%	0.08%	0.96%	11.27%	41.52%	45.90%
2015	0.25%	0.00%	0.11%	1.58%	14.55%	37.88%	45.63%
2016	0.21%	0.00%	0.11%	1.81%	15.48%	36.41%	45.97%
2017	0.20%	0.00%	0.19%	2.52%	17.67%	36.10%	43.31%
2018	0.17%	0.00%	0.40%	3.90%	20.96%	36.88%	37.69%
2019	0.14%	0.00%	0.53%	4.72%	22.54%	37.63%	34.45%
2020	0.08%	0.00%	0.31%	3.13%	18.84%	39.14%	38.50%

Initial Relative Loan Size Distribution

The relative loan size variable is computed by comparing the mortgage origination amount with the average loan size of all FHA-insured loans originated within the same period and in the same state. Empirical results show that this variable is very significant in predicting prepayments.

FHA experience indicates that larger loans tend to perform better compared with smaller loans in the same geographical area, all else being equal. Larger loans incur claims at a lower probability and in those cases where a claim occurs, loss severity tends to be lower. Prior to the increase in FHA's loan limits in Fiscal Year 2008, houses securing larger FHA loans tended to fall into the average house price range within their surrounding areas. Since this market is relatively liquid and there are a relatively large number of similar-quality homes in the area, the house price volatility of these houses tends to be relatively low in comparison to the house price volatility of extremely low- and high-priced houses. With the increased FHA loan size limit, FHA started

endorsements of higher-priced houses after Fiscal Year 2008.

Table 17 shows the percentage of new fully underwritten mortgage originations within each relative loan size category. The distribution has been reasonably stable over time with the largest share in the 75-to-125 percent of area average loan size categories. However, since Fiscal Year 2000, there has been a steady increase in the dispersion among loan size categories. The proportion in the highest loan size category increased from 11.1% in Fiscal Year 2001 to 25.1% in Fiscal Year 2011, but has decreased since then to 16.3% in 2020. On the other hand, the share in lowest loan size category also increased from 1.8% percent in Fiscal Year 2004 to 5.2% in Fiscal Year 2012, and has since decreased to 2.8% in Fiscal Year 2020. The increase in both the highest and lowest loan size categories demonstrated the penetration of FHA products into high-balance loans and the resurgence of the low-balance loan, but this penetration has decreased slightly since 2011.

Table 17: Percentage of Origination Count by Relative Loan Size

Cohort	0-50% of Average Loan Size	50-75% of Average Loan Size	75-100% of Average Loan Size	100-125% of Average Loan Size	125-150% of Average Loan Size	>150% of Average Loan Size
1985	1.75%	10.64%	26.03%	34.72%	21.12%	5.75%
1986	1.37%	10.11%	27.00%	38.76%	18.86%	3.91%
1987	1.17%	9.80%	26.62%	38.84%	19.89%	3.67%
1988	1.49%	10.72%	25.59%	35.52%	20.45%	6.22%
1989	1.73%	11.18%	25.34%	32.46%	21.16%	8.12%
1990	1.76%	11.33%	25.08%	31.18%	21.08%	9.58%
1991	1.84%	11.42%	25.14%	30.04%	21.63%	9.93%
1992	1.72%	11.09%	25.35%	31.30%	21.60%	8.95%
1993	1.50%	10.62%	25.57%	31.92%	22.03%	8.37%
1994	1.19%	9.26%	22.81%	30.13%	24.62%	11.98%
1995	1.61%	11.45%	24.67%	30.38%	22.47%	9.41%
1996	1.61%	11.32%	24.71%	31.28%	22.93%	8.15%
1997	1.75%	11.89%	24.98%	31.66%	21.94%	7.78%
1998	1.64%	11.15%	24.54%	32.83%	22.18%	7.66%
1999	1.80%	11.37%	24.47%	30.74%	20.80%	10.83%
2000	2.02%	11.73%	24.44%	29.27%	20.36%	12.18%
2001	2.22%	12.12%	25.69%	29.52%	19.34%	11.11%
2002	2.06%	11.14%	24.59%	29.61%	19.97%	12.64%
2003	1.81%	10.35%	23.49%	29.85%	20.81%	13.69%
2004	1.79%	10.06%	22.41%	28.83%	21.57%	15.34%
2005	1.92%	10.94%	22.92%	28.28%	21.07%	14.89%
2006	2.17%	11.94%	23.10%	28.04%	20.11%	14.64%
2007	2.49%	12.58%	23.37%	27.55%	19.48%	14.52%
2008	2.80%	12.99%	24.33%	25.44%	17.01%	17.42%
2009	3.94%	14.58%	23.42%	21.70%	15.10%	21.25%
2010	4.39%	15.01%	22.50%	20.33%	14.25%	23.52%
2011	5.06%	15.39%	21.34%	19.31%	13.78%	25.12%
2012	5.18%	15.63%	21.81%	19.71%	13.85%	23.83%
2013	4.10%	13.80%	21.06%	20.10%	14.72%	26.23%
2014	3.59%	13.18%	21.48%	20.91%	15.50%	25.34%
2015	3.85%	13.88%	23.01%	21.74%	15.65%	21.87%
2016	3.39%	12.93%	22.76%	22.41%	16.66%	21.86%
2017	3.14%	12.46%	22.90%	23.32%	17.44%	20.74%
2018	3.11%	12.53%	23.33%	24.34%	17.10%	19.59%
2019	3.19%	12.75%	24.23%	24.97%	16.92%	17.94%
2020	2.82%	12.32%	24.84%	25.98%	17.76%	16.28%

Initial Contract Interest Rate

Table 18 shows the average mortgage contract rate by mortgage type since Fiscal Year 1997. Prior to Fiscal Year 2020, average contract rates in Fiscal Year 2013 were the lowest of this entire time period. Rates had been higher since 2013, but have decreased significantly in Fiscal Year 2020 by almost one full percentage point. Interest rates for 30-year SRs are at the lowest level since 1997, which is one of the reasons for the significant surge in refinance activity in 2020.

In general, an FRM with a lower initial contract rate tends to prepay at a slower speed. As interest rates are projected to rise, the prepayment rates of the recent originations are likely to remain low. As these loans will have longer durations, as reflected in our predictive models, more insurance premium income will be generated, thus tending to improve the economic value of these recent books with historically low contract rates.

Also, a mortgage with a contract rate lower than the market rate tends to experience a lower probability of default because the borrower has the incentive to keep the below-market rate mortgage longer even when experiencing some negative equity. This tendency is reflected in our predictive models. As mortgage rates rise in the future, the recent low-interest-rate books are projected to incur fewer defaults and claims. This also tends to improve the economic value.

Table 18: Average Contract Interest Rate by Loan Type (Percent)

Fiscal Year	30-Year FRM	15-Year FRM	ARMs	30-Year SRs	15-Year SRs	ARMs SRs	Book of Business
1997	8.01	7.77	6.60	8.30	8.04	6.86	7.62
1998	7.42	7.23	6.25	7.62	7.24	6.54	7.22
1999	7.21	6.94	5.96	7.20	6.91	6.11	7.15
2000	8.22	7.95	6.87	8.07	7.81	6.15	8.07
2001	7.69	7.25	6.57	7.44	6.89	6.22	7.61
2002	7.07	6.60	5.37	7.02	6.46	5.38	6.92
2003	6.21	5.62	4.59	6.07	5.55	4.56	6.02
2004	6.08	5.52	4.41	5.92	5.46	4.34	5.84
2005	5.94	5.64	4.78	5.85	5.65	4.67	5.80
2006	6.29	6.14	5.36	6.10	6.02	5.03	6.25
2007	6.51	6.40	5.62	6.38	6.22	5.59	6.49
2008	6.33	5.95	5.39	6.09	5.64	5.33	6.30
2009	5.62	5.14	5.05	5.26	4.81	4.54	5.53
2010	5.14	4.62	3.98	5.13	4.65	4.28	5.08
2011	4.65	4.16	3.51	4.63	4.16	3.69	4.57
2012	3.98	3.46	3.14	3.98	3.53	3.38	3.93
2013	3.62	3.16	2.82	3.71	3.36	2.86	3.63
2014	4.30	3.71	3.31	4.51	3.91	3.39	4.28
2015	4.03	3.47	3.26	3.99	3.69	3.36	4.00
2016	3.91	3.40	3.23	3.87	3.53	3.35	3.89
2017	4.03	3.50	3.18	3.75	3.59	3.02	3.98
2018	4.54	3.87	3.51	4.08	4.03	3.49	4.50
2019	4.68	4.15	4.00	4.23	4.44	4.02	4.64
2020	3.64	3.50	3.47	3.51	3.44	3.50	3.61

Source of Down Payment Assistance

Table 19 shows the distribution of annual loan endorsements by source of down payment assistance. Secondary loans provided by governments were included in the category of down payment assistance, and typically these

were local government units.

Starting in Fiscal Year 2000, there was a rapid increase in the share of loans with gift letters from non-profit, religious, or community institutions. Home sellers contributed a large share of these funds to the non-profit organizations, which subsequently provided the gift to the buyers of the same properties to fulfill the down payment requirements. This concentration increased to over 20% in the 2005 - 2007 cohorts. FHA effectively terminated seller-financed down payment assistance on October 1, 2008 because of the high losses associated with these loans. The share of loans with this type of assistance declined to negligible amounts after Fiscal Year 2008.

From 2008 to 2018, the percentage of loans with down payment assistance from a relative had increased from 6.8% to 21.7%. In Fiscal Year 2020, this percentage has decreased to 15.8%. Also, the share of loans with government down payment assistance increased from 2013 to 2016, but has decreased since then.

Table 19: Percentage of Down payment assist Loan Counts by Source

Cohort	No Gift	Relative	Non-Profit, Religious or Community	Government
1998	76.81%	22.76%	0.20%	0.23%
1999	81.69%	17.11%	0.53%	0.68%
2000	77.56%	18.97%	1.69%	1.78%
2001	83.35%	11.72%	3.75%	1.17%
2002	83.21%	9.32%	6.29%	1.18%
2003	81.92%	7.61%	9.33%	1.13%
2004	71.69%	9.75%	16.95%	1.61%
2005	64.64%	9.91%	22.96%	2.48%
2006	64.13%	9.44%	23.04%	3.39%
2007	68.25%	7.66%	21.27%	2.81%
2008	74.46%	6.82%	17.38%	1.33%
2009	86.54%	10.34%	2.70%	0.42%
2010	83.99%	15.42%	0.09%	0.51%
2011	85.25%	13.91%	0.12%	0.72%
2012	85.76%	13.44%	0.13%	0.68%
2013	86.89%	12.33%	0.09%	0.70%
2014	77.73%	20.66%	0.29%	1.32%
2015	79.44%	17.88%	0.72%	1.95%
2016	77.31%	19.26%	0.91%	2.53%
2017	77.40%	19.70%	0.74%	2.16%
2018	76.34%	21.71%	0.41%	1.54%
2019	78.19%	20.58%	0.22%	1.01%
2020	82.93%	15.80%	0.19%	1.09%

Section 5 – Summary of Methodology

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

Data Sources

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

From FHA, we have received the following data:

1. Claims_601_Case_Data: used for the cash entry from note sales
2. IDB: core case data; this table is derived based on fields from IDB_1, IDB_2, and the Decision_FICO_Score (one file each for 1975 – 2020)
3. Lossmit_Costs: derived table based on the Loss Mitigation table and IDB_1, used to obtain mitigation claim amounts
4. Sams_case_record: used to determine the status of the conveyances, the capital income/expense amounts, the sales and real estate owned (REO) expenses and sales proceeds to FHA, where applicable
5. SFDW_Default_History: used to create period information related to default histories
6. Fannie_FICO_pre2004: used for supplemental credit data
7. Current_Status: table displaying the current status of each loan
8. SFDW Dictionary for Pinnacle: data dictionary for the tables provided by FHA

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

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

From OMB, we have received the Economic Assumptions for the 2021 Budget.

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

1. HPI
2. Mortgage rates
3. Treasury rates
4. Unemployment rates
5. GDP
6. Consumer Confidence Index
7. Small Business Optimism Index

Data Processing – Mortgage Level Modeling (Appendix A)

Starting with the raw data, Pinnacle processed the data to create datasets for developing the mortgage level transition and loss severity models. The first step in preparing the data for analysis was the processing of the

economic data. Historical economic data was imported by quarter, additional data elements were derived, and data was joined to the FHA mortgage data.

Once the economic data was prepared, the core data processing occurred. We used mortgage-level data to reconstruct quarterly mortgage-event histories by relating mortgage origination information to other data reflecting events that occurred over the history of the mortgage. In the process of creating quarterly event histories, each mortgage contributed an observed transition for every quarter from origination up to and including the period of mortgage termination, or until the third quarter of Fiscal Year 2020 if the mortgage remained active.

Data Reconciliation

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

The following tables are based on data as of September 30, 2020.

Table 20: Data Reconciliation - Number of Active Loans

Number of Active Loans				
Credit Subsidy Cohort	Federal Housing Administration (Data as of September 2020)	Independent Actuary (Data as of September 2020)	Absolute Difference (Actuary - FHA)	Percent Difference (Actuary - FHA) / FHA
1992	10,156	10,123	(33)	0%
1993	16,952	16,877	(75)	0%
1994	25,046	24,937	(109)	0%
1995	12,676	12,645	(31)	0%
1996	20,933	20,901	(32)	0%
1997	22,747	22,706	(41)	0%
1998	35,772	35,651	(121)	0%
1999	45,228	45,053	(175)	0%
2000	25,416	25,270	(146)	-1%
2001	44,185	44,042	(143)	0%
2002	64,460	64,036	(424)	-1%
2003	93,021	92,214	(807)	-1%
2004	116,133	114,992	(1,141)	-1%
2005	84,556	83,825	(731)	-1%
2006	68,570	68,470	(100)	0%
2007	65,537	65,531	(6)	0%
2008	152,662	152,651	(11)	0%
2009	331,410	331,399	(11)	0%
2010	414,277	414,261	(16)	0%
2011	333,745	333,745	0	0%
2012	417,660	417,660	0	0%
2013	586,382	586,382	0	0%
2014	269,885	269,885	0	0%
2015	488,122	488,122	0	0%
2016	707,384	707,384	0	0%
2017	800,804	800,804	0	0%
2018	680,155	680,155	0	0%
2019	713,490	713,490	0	0%
2020	1,252,492	1,252,492	0	0%
Total	7,899,856	7,895,703	(4,153)	0%

Table 21: Data Reconciliation - Insurance in Force

Insurance in Force ($M)				
= Original Loan Amount on Active Loans				
Credit Subsidy Cohort	Federal Housing Administration (Data as of September 2020)	Independent Actuary (Data as of September 2020)	Absolute Difference (Actuary - FHA)	Percent Difference (Actuary - FHA) / FHA
1992	632,737,045	630,175,704	(2,561,341)	0%
1993	1,128,051,113	1,122,662,281	(5,388,832)	0%
1994	1,693,390,286	1,685,534,003	(7,856,283)	0%
1995	804,863,327	802,945,779	(1,917,548)	0%
1996	1,383,145,048	1,381,194,526	(1,950,522)	0%
1997	1,538,664,165	1,536,111,497	(2,552,668)	0%
1998	2,622,750,438	2,614,282,837	(8,467,601)	0%
1999	3,477,643,199	3,465,625,793	(12,017,406)	0%
2000	1,928,948,049	1,917,580,035	(11,368,014)	-1%
2001	3,784,816,154	3,774,058,838	(10,757,316)	0%
2002	5,986,934,870	5,952,126,416	(34,808,454)	-1%
2003	9,760,137,449	9,687,453,499	(72,683,950)	-1%
2004	12,226,545,193	12,130,291,064	(96,254,129)	-1%
2005	9,134,628,096	9,072,357,217	(62,270,879)	-1%
2006	7,782,880,704	7,773,600,757	(9,279,947)	0%
2007	8,006,143,056	8,005,729,158	(413,898)	0%
2008	21,311,279,293	21,310,167,626	(1,111,667)	0%
2009	50,244,615,492	50,243,397,129	(1,218,363)	0%
2010	61,134,262,611	61,132,626,092	(1,636,519)	0%
2011	50,658,951,615	50,658,951,615	0	0%
2012	65,322,259,638	65,322,259,638	0	0%
2013	94,545,227,961	94,545,227,961	0	0%
2014	37,222,658,900	37,222,658,900	0	0%
2015	80,619,068,501	80,619,068,501	0	0%
2016	125,913,138,455	125,913,138,455	0	0%
2017	150,269,903,430	150,269,903,430	0	0%
2018	129,528,758,809	129,528,758,809	0	0%
2019	144,553,787,700	144,553,787,700	0	0%
2020	289,995,649,771	289,995,649,771	0	0%
Total	1,373,211,840,368	1,372,867,325,031	(344,515,337)	0%

Table 22: Data Reconciliation - Number of 90 Day Delinquencies

Number of 90 Day Delinquencies				
= Current Number of 90 Day Delinquencies				
Credit Subsidy Cohort	Federal Housing Administration (Data as of September 2020)	Independent Actuary (Data as of September 2020)	Absolute Difference (Actuary - FHA)	Percent Difference (Actuary - FHA) / FHA
1992	557	557	0	0%
1993	871	873	2	0%
1994	1,446	1,447	1	0%
1995	1,028	1,029	1	0%
1996	1,892	1,894	2	0%
1997	2,101	2,101	0	0%
1998	3,339	3,339	0	0%
1999	4,689	4,690	1	0%
2000	3,206	3,208	2	0%
2001	5,153	5,158	5	0%
2002	7,252	7,253	1	0%
2003	10,201	10,210	9	0%
2004	14,173	14,185	12	0%
2005	11,566	11,576	10	0%
2006	10,204	10,207	3	0%
2007	10,741	10,747	6	0%
2008	26,057	26,075	18	0%
2009	43,241	43,280	39	0%
2010	46,407	46,438	31	0%
2011	35,032	35,045	13	0%
2012	40,869	40,894	25	0%
2013	52,392	52,426	34	0%
2014	34,410	34,427	17	0%
2015	61,439	61,468	29	0%
2016	88,411	88,447	36	0%
2017	105,748	105,792	44	0%
2018	102,729	102,793	64	0%
2019	104,098	104,175	77	0%
2020	71,257	71,352	95	0%
Total	900,509	901,086	577	0%

Table 23: Data Reconciliation - Number of Claims to Date

Number of Claims To Date				
Credit Subsidy Cohort	Federal Housing Administration (Data as of September 2020)	Independent Actuary (Data as of September 2020)	Absolute Difference (Actuary - FHA)	Percent Difference (Actuary - FHA) / FHA
1992	36,778	36,778	0	0%
1993	52,278	52,276	(2)	0%
1994	65,920	65,919	(1)	0%
1995	44,678	44,678	0	0%
1996	63,473	63,466	(7)	0%
1997	59,869	59,860	(9)	0%
1998	67,469	67,459	(10)	0%
1999	84,217	84,204	(13)	0%
2000	71,330	71,321	(9)	0%
2001	85,345	85,335	(10)	0%
2002	90,497	90,476	(21)	0%
2003	91,202	91,188	(14)	0%
2004	115,820	115,798	(22)	0%
2005	92,054	92,045	(9)	0%
2006	94,239	94,238	(1)	0%
2007	106,321	106,321	0	0%
2008	223,769	223,768	(1)	0%
2009	225,483	225,483	0	0%
2010	115,004	115,004	0	0%
2011	47,109	47,109	0	0%
2012	29,148	29,148	0	0%
2013	26,684	26,684	0	0%
2014	15,349	15,349	0	0%
2015	14,681	14,681	0	0%
2016	12,201	12,201	0	0%
2017	8,224	8,224	0	0%
2018	3,678	3,678	0	0%
2019	533	533	0	0%
2020	5	5	0	0%
Total	1,943,353	1,943,224	(129)	0%

Specification of Mortgage Transition Models (Appendix B)

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

The predictive models reflect the fact that mortgage borrowers possess two mutually exclusive options to terminate the mortgage, one to prepay the mortgage and the other to default by permanently ceasing payment. From FHA's point of view, prepayment and claim events are the corresponding outcomes of "competing risks" in the sense that they are mutually exclusive, and realization of one of these events precludes the other. Prepayment means cessation of cash inflows from MIP, but at the same time eliminates any chance of incurring claim losses. Conversely, termination through foreclosure means claim costs are incurred and MIP inflows cease, but uncertainty about the possibility and timing of prepayment is eliminated.

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

We model five possible transitions from a mortgage in current status: remain current, default (become 90 or more days delinquent), prepay by streamlined refinance (SR), other prepayments or self-cure. (There is also one additional transition possible – cure with a modification. This transition rarely occurs for a mortgage in Current status, but most often occurs with a mortgage in Default Status. Therefore, we have include these transitions in the Default transition model development). Given that these are mutually exclusive outcomes, the sum of the probabilities for all possible transitions is 100%. For a mortgage in default status at the beginning of a particular time period, the five possible transitions are that it may be prepaid, transition into a claim, self-cure, cure with a mortgage modification, or remain in default.

For this Actuarial Review, we have separately identified claims in default and in COVID-19 forbearance. Borrowers who experienced an adverse impact on their ability to make on-time mortgage payments due to the COVID-19 pandemic are eligible for forbearance for an initial period of six months, and this initial period can be extended by up to six additional months. All borrowers are eligible for COVID-19 forbearance; therefore, if a borrower is granted this forbearance, it will likely delay the transition of the mortgage in default to a subsequent status. Therefore, we develop additional transition assumptions for COVID-19 forbearances to reflect the potential slow-down in resolution over the next twelve months. Over the projected period that loans can be in a COVID-19 forbearance, Pinnacle projects that a portion of the loans eligible for loss mitigation will exit forbearance as either a loss mitigation claim, a loan still in default or a payoff. For loans that are in COVID-19 forbearance but not eligible for loss mitigation, Pinnacle projects that a portion of these loans will exit forbearance as a default loan. As loans can enter COVID-19 forbearance through the end of 2020, this adjustment will persist into Fiscal Year 2021.

In the 2017 and 2018 Actuarial Reviews, Pinnacle used multinomial logistic models to estimate the probability of transition for current and default mortgages. In the 2019 Actuarial Review, we used binomial logistic models to predict each transition separately, and once all the binomial models were completed, we adjusted the binomial probabilities to reflect the multinomial nature of the transitions. The primary reason for making this change was

that it allowed us to better model each transition using the independent variables that were significant for that transition. The multinomial structure used in the 2017 and 2018 Actuarial Reviews did not allow for the use of variables just for individual transitions – (i.e., if a variable was included in the model it applied to all transitions). This resulted in over-specification of the transition models, as there are some independent variables that were not significant for some transitions. To address this, Pinnacle used binomial models for each transition and applied an adjustment to reflect the multinomial nature of the process. Pinnacle has continued the use of binomial models for this Actuarial Review.

Pinnacle investigated the use of Multinomial Discrete Choice (MDC) models for this analysis. MDC models allow all transitions to be modeled simultaneously, and also allows for the use of independent variables only for specific transitions. Pinnacle compared the MDC approach to the binomial logistic approach, and concluded that the two approaches produce identical results. We also observed that the MDC approach took significantly longer to complete as it was more computationally intensive. Because the results of the two methods were identical and the binomial logistic models ran more efficiently, we decided to continue with the binomial logistic approach with the multinomial adjustment.

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

In the 2017 and 2018 Actuarial Reviews, we developed the predictive models based on estimation samples of the data for the Current Status transition models with ending condition of Current, Prepayment of Streamline Refinance. For Default Status transition models, we sampled data with the ending condition of Default. With this analysis, for the transition models with the initial condition of C for the FRM30 non-SR product, we used a random sample of 50% of the data. For all other products, we used 100% of the data in the model development. For Default transition models, we used 100% of the data in the model development for all products.

Loss Severity Model (Appendix C)

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

models.

In addition to the loss severity models, we have also developed separate models to project the frequency of loss mitigation claims and the severity associated with these claims.

All loans granted a COVID-19 forbearance must be evaluated for eligibility for a partial claim and/or loan modification. Borrowers who were current or less than 30 days past due as of March 1, 2020 must be evaluated for COVID-19 loss mitigation options. Once a loan is projected to exit COVID-19 forbearance, Pinnacle will project the transition path of the loan based on the percentages estimated from forebearance exits that have occurred in 2020. If the loan is projected to be a COVID-19 loss mitigation claim, the severity will be estimated based on the loss mitigation severity model.

Cash Flow Projections (Appendix E)

After developing the transition and severity predictive models, we use this information to project future cash flows. The cash flow model includes the calculation of five types of cash flows:

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

The federal credit subsidy present value conversion factors provided by OMB are used to discount future cash flows to determine their present value as of the end of Fiscal Year 2020.

FHA executed note sales in November 2015 and September 2016. Based on information provided by HUD, there are no current planned or pending note sales. Therefore, we have not projected any future note sales in our analysis.

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

- One-year CMT rates
- Three-year CMT rates
- Five-year CMT rates
- 10-year CMT rates
- 30-year CMT rates

- 30-year Fixed Rate Mortgage (FRM) rates
- FHFA national purchase-only HPI
- Unemployment rates by state
- Change in unemployment rate
- One-year GDP ratio

Appendices

A. Data - Sources, Processing and Reconciliation
B. Transition Models
C. Loss Severity Models
D. Economic Scenarios
E. Cash Flow Analysis
F. Review of HUD Analysis of Economic Net Worth, Comparison of HUD and Pinnacle Models, and Assessment of Vulnerabilities
G. Summary of Historical and Projected Claim Rates, Non-Claim Termination Rates and Loss Severities

Appendix A: Data – Sources, Processing and Reconciliation

Data Sources

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

From FHA, we have received the following data:

1. Claims_601_Case_Data: used for the cash entry from note sales
2. IDB: core case data; this table is derived based on fields from IDB_1, IDB_2, and the Decision_FICO_Score (one file each for 1975 – 2020)
3. Lossmit_Costs: derived table based on the Loss Mitigation table and IDB_1, used to obtain mitigation claim amounts
4. Sams_case_record: used to determine the status of the conveyances, the capital income/expense amounts, the sales and REO expenses, and sales proceeds to FHA, where applicable
5. SFDW_Default_History: used to create period information related to default histories
6. Fannie_FICO_pre2004: used for supplemental credit data
7. Current_Status: table displaying the current status of each loan
8. SFDW Dictionary for Pinnacle: data dictionary for the tables provided by FHA

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

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

From OMB, we have received the Economic Assumptions for the 2021 Budget.

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

1. HPI
2. Mortgage rates
3. Treasury rates
4. Unemployment rates
5. GDP
6. Consumer Confidence Index
7. Small Business Optimism Index

Data Processing – Mortgage Level Modeling

Starting with the raw data, Pinnacle processed the data to create datasets for developing the mortgage level transition and loss severity models. The first step in preparing the data for analysis was the processing of the economic data. Historical economic data was imported by quarter, additional data elements were derived, and data was joined to the FHA mortgage data.

Once the economic data was prepared, the core data processing occurred. We used mortgage-level data to reconstruct quarterly mortgage-event histories by relating mortgage origination information to other data reflecting events that occurred over the history of the mortgage. In the process of creating quarterly event histories, each mortgage contributed an observed transition for every quarter from origination up to and including the period of mortgage termination, or until the third quarter of Fiscal Year 2020, if the mortgage remained active.

Data Reconciliation

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

The following tables are based on data as of September 30, 2020, as this was the data used to develop the transition and net loss models.

Table 24: Data Reconciliation - Number of Active Loans

Number of Active Loans				
Credit Subsidy Cohort	Federal Housing Administration (Data as of September 2020)	Independent Actuary (Data as of September 2020)	Absolute Difference (Actuary - FHA)	Percent Difference (Actuary - FHA) / FHA
1992	10,156	10,123	(33)	0%
1993	16,952	16,877	(75)	0%
1994	25,046	24,937	(109)	0%
1995	12,676	12,645	(31)	0%
1996	20,933	20,901	(32)	0%
1997	22,747	22,706	(41)	0%
1998	35,772	35,651	(121)	0%
1999	45,228	45,053	(175)	0%
2000	25,416	25,270	(146)	-1%
2001	44,185	44,042	(143)	0%
2002	64,460	64,036	(424)	-1%
2003	93,021	92,214	(807)	-1%
2004	116,133	114,992	(1,141)	-1%
2005	84,556	83,825	(731)	-1%
2006	68,570	68,470	(100)	0%
2007	65,537	65,531	(6)	0%
2008	152,662	152,651	(11)	0%
2009	331,410	331,399	(11)	0%
2010	414,277	414,261	(16)	0%
2011	333,745	333,745	0	0%
2012	417,660	417,660	0	0%
2013	586,382	586,382	0	0%
2014	269,885	269,885	0	0%
2015	488,122	488,122	0	0%
2016	707,384	707,384	0	0%
2017	800,804	800,804	0	0%
2018	680,155	680,155	0	0%
2019	713,490	713,490	0	0%
2020	1,252,492	1,252,492	0	0%
Total	7,899,856	7,895,703	(4,153)	0%

Table 25: Data Reconciliation - Insurance in Force

Insurance in Force ($M)				
= Original Loan Amount on Active Loans				
Credit Subsidy Cohort	Federal Housing Administration (Data as of September 2020)	Independent Actuary (Data as of September 2020)	Absolute Difference (Actuary - FHA)	Percent Difference (Actuary - FHA) / FHA
1992	632,737,045	630,175,704	(2,561,341)	0%
1993	1,128,051,113	1,122,662,281	(5,388,832)	0%
1994	1,693,390,286	1,685,534,003	(7,856,283)	0%
1995	804,863,327	802,945,779	(1,917,548)	0%
1996	1,383,145,048	1,381,194,526	(1,950,522)	0%
1997	1,538,664,165	1,536,111,497	(2,552,668)	0%
1998	2,622,750,438	2,614,282,837	(8,467,601)	0%
1999	3,477,643,199	3,465,625,793	(12,017,406)	0%
2000	1,928,948,049	1,917,580,035	(11,368,014)	-1%
2001	3,784,816,154	3,774,058,838	(10,757,316)	0%
2002	5,986,934,870	5,952,126,416	(34,808,454)	-1%
2003	9,760,137,449	9,687,453,499	(72,683,950)	-1%
2004	12,226,545,193	12,130,291,064	(96,254,129)	-1%
2005	9,134,628,096	9,072,357,217	(62,270,879)	-1%
2006	7,782,880,704	7,773,600,757	(9,279,947)	0%
2007	8,006,143,056	8,005,729,158	(413,898)	0%
2008	21,311,279,293	21,310,167,626	(1,111,667)	0%
2009	50,244,615,492	50,243,397,129	(1,218,363)	0%
2010	61,134,262,611	61,132,626,092	(1,636,519)	0%
2011	50,658,951,615	50,658,951,615	0	0%
2012	65,322,259,638	65,322,259,638	0	0%
2013	94,545,227,961	94,545,227,961	0	0%
2014	37,222,658,900	37,222,658,900	0	0%
2015	80,619,068,501	80,619,068,501	0	0%
2016	125,913,138,455	125,913,138,455	0	0%
2017	150,269,903,430	150,269,903,430	0	0%
2018	129,528,758,809	129,528,758,809	0	0%
2019	144,553,787,700	144,553,787,700	0	0%
2020	289,995,649,771	289,995,649,771	0	0%
Total	1,373,211,840,368	1,372,867,325,031	(344,515,337)	0%

Table 26: Data Reconciliation - Number of 90 Day Delinquencies

Number of 90 Day Delinquencies				
= Current Number of 90 Day Delinquencies				
Credit Subsidy Cohort	Federal Housing Administration (Data as of September 2020)	Independent Actuary (Data as of September 2020)	Absolute Difference (Actuary - FHA)	Percent Difference (Actuary - FHA) / FHA
1992	557	557	0	0%
1993	871	873	2	0%
1994	1,446	1,447	1	0%
1995	1,028	1,029	1	0%
1996	1,892	1,894	2	0%
1997	2,101	2,101	0	0%
1998	3,339	3,339	0	0%
1999	4,689	4,690	1	0%
2000	3,206	3,208	2	0%
2001	5,153	5,158	5	0%
2002	7,252	7,253	1	0%
2003	10,201	10,210	9	0%
2004	14,173	14,185	12	0%
2005	11,566	11,576	10	0%
2006	10,204	10,207	3	0%
2007	10,741	10,747	6	0%
2008	26,057	26,075	18	0%
2009	43,241	43,280	39	0%
2010	46,407	46,438	31	0%
2011	35,032	35,045	13	0%
2012	40,869	40,894	25	0%
2013	52,392	52,426	34	0%
2014	34,410	34,427	17	0%
2015	61,439	61,468	29	0%
2016	88,411	88,447	36	0%
2017	105,748	105,792	44	0%
2018	102,729	102,793	64	0%
2019	104,098	104,175	77	0%
2020	71,257	71,352	95	0%
Total	900,509	901,086	577	0%

Table 27: Data Reconciliation - Number of Claims to Date

Number of Claims To Date				
Credit Subsidy Cohort	Federal Housing Administration (Data as of September 2020)	Independent Actuary (Data as of September 2020)	Absolute Difference (Actuary - FHA)	Percent Difference (Actuary - FHA) / FHA
1992	36,778	36,778	0	0%
1993	52,278	52,276	(2)	0%
1994	65,920	65,919	(1)	0%
1995	44,678	44,678	0	0%
1996	63,473	63,466	(7)	0%
1997	59,869	59,860	(9)	0%
1998	67,469	67,459	(10)	0%
1999	84,217	84,204	(13)	0%
2000	71,330	71,321	(9)	0%
2001	85,345	85,335	(10)	0%
2002	90,497	90,476	(21)	0%
2003	91,202	91,188	(14)	0%
2004	115,820	115,798	(22)	0%
2005	92,054	92,045	(9)	0%
2006	94,239	94,238	(1)	0%
2007	106,321	106,321	0	0%
2008	223,769	223,768	(1)	0%
2009	225,483	225,483	0	0%
2010	115,004	115,004	0	0%
2011	47,109	47,109	0	0%
2012	29,148	29,148	0	0%
2013	26,684	26,684	0	0%
2014	15,349	15,349	0	0%
2015	14,681	14,681	0	0%
2016	12,201	12,201	0	0%
2017	8,224	8,224	0	0%
2018	3,678	3,678	0	0%
2019	533	533	0	0%
2020	5	5	0	0%
Total	1,943,353	1,943,224	(129)	0%

Appendix B – Transition Models

This appendix describes the technical details of the predictive models used to estimate the transition behavior of forward mortgages.

Section 1 summarizes the model specifications used to analyze FHA mortgage status transitions and the subsequent ultimate claim and prepayment rates. This section also presents the statistical theory behind multinomial logistic models.

Section 2 describes the explanatory variables used in the models.

Section 3 shows the model parameters.

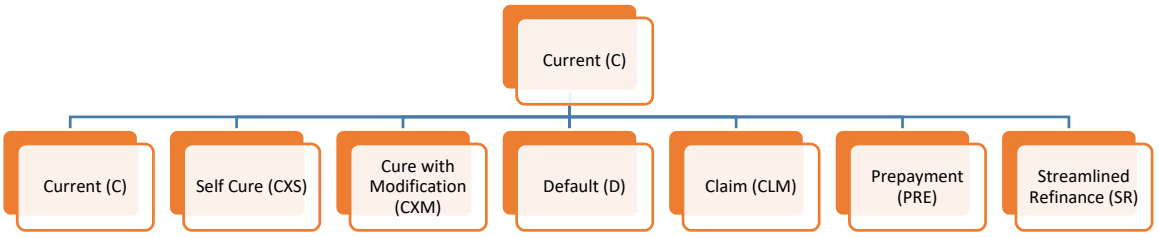
Section 4 shows the model validation of the binomial logistic models.

Section 1: Model Specification

Prior to the 2010 Actuarial Review, a competing-risk framework based on multinomial logistic models for quarterly conditional probabilities of prepayment and claim terminations was used. Starting with the 2010 Review, a third "competing risk" was introduced: 90-day delinquency, or default. The date from which a mortgage is first reported to be 90 or more days late is used to identify the start of a default episode, and this episode continues until ended by cure or the mortgage terminates through claim or prepayment. Active mortgages that are not in a 90-day default episode at the beginning of the quarter are classified as current.

Figure 12 below shows the possible "current" status transitions that have been modeled using the multinomial framework.

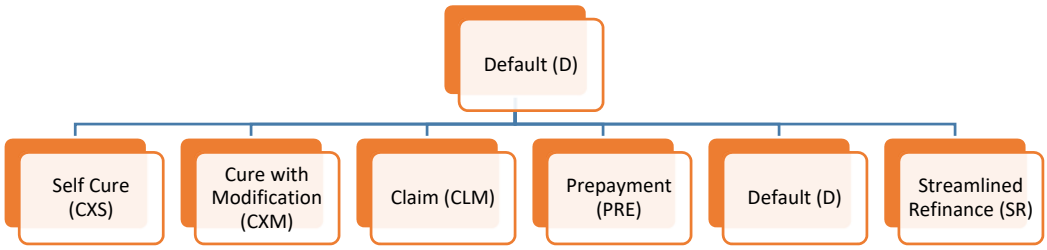
Figure 12: Transition Models – Initial Current Status



Mortgages in current status (C) at the beginning of the quarter can default and cure in the same quarter (CXS and CXM), transition to default status (D) at the start of the next quarter, result in a claim (CLM) or terminate as a prepayment due to an FHA Streamlined Refinance (SR) or as a prepayment (PRE) for any reason other than SR. There are two types of cures, a self-cure (CXS) and a cure that includes a mortgage modification (CXM). Also, due to the very low likelihood of a current mortgage transitioning into to a CLM in one quarter, we have combined D and CLM into one category (DCLM).

The figure below shows the possible default status transitions that have been modeled using the multinomial framework.

Figure 13: Transition Models – Initial Default Status



For mortgages that begin the quarter in default, they can cure either by the borrower becoming current on their own (CXS), or they can cure with a modification in the terms of the mortgage (CXM). The mortgage can also terminate as a prepayment due to an SR or as a prepayment (PRE) for any reason other than SR, turn into a claim (CLM) or remain in default (D). For the development of the transition models, we have combined PRE and SR into one category (END).

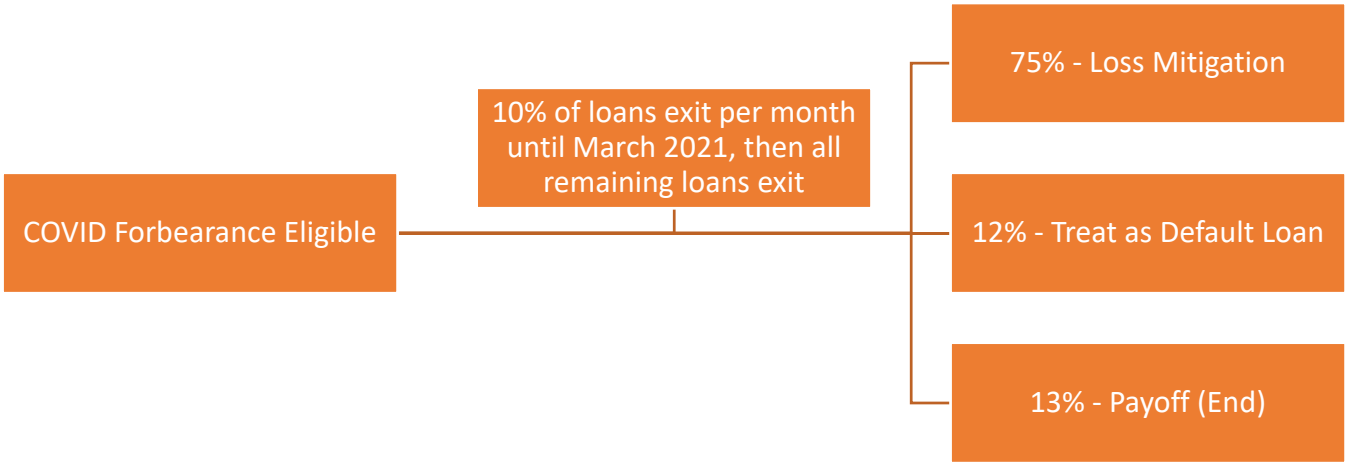
As the mortgage transitions through multiple stages, the historical status of the mortgage is retained. At any point in the life of the mortgage, we track both the number of prior times the mortgage was either in default or modified as well as the length of time since the mortgage was in the prior stage.

As a result of the COVID-19 pandemic, borrowers who experienced an adverse impact on their ability to make on-time mortgage payments are eligible for forbearance for an initial period of six months, and this initial period can be extended by up to six additional months. Borrowers are eligible to receive COVID-19 forbearance through December 31, 2020. This may result in loans being in forbearance through the end of 2021. While a loan is in forbearance, the borrower does not have to make mortgage payments, which technically means the loan is in default. As no action can be taken on these loans by the lender while the loan is in forbearance, the path of these loans cannot be projected by the normal default models.

For loans in forbearance, some may be eligible for a partial claim or loan modification if they were current on their payments as of March 1, 2020. Based on the forbearance criteria, Pinnacle has developed an adjustment to the simulation process to handle these COVID-19 forbearance loans. Loans in COVID-19 forbearance as of

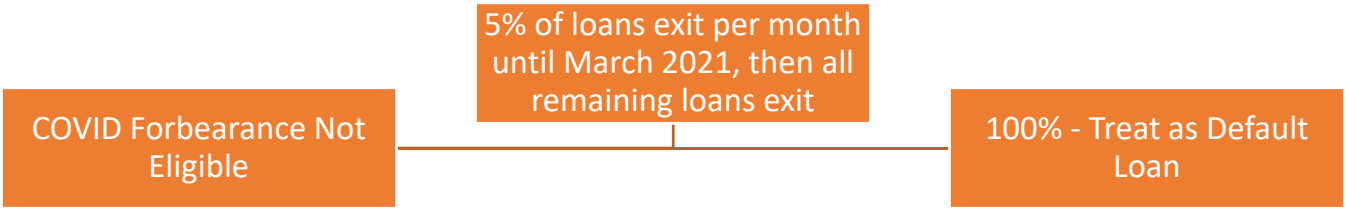
September 30, 2020 that are eligible for a loan modification or partial claim will be simulated as follows:

Figure 14: COVID-19 Forbearance SImulation – Loans Eligible for Partial Claim or Loan Modification



Loans in COVID-19 forbearance as of September 30, 2020 that are not eligible for a loan modification or partial claim will be simulated as follows:

Figure 15: COVID-19 Forbearance Simulation – Loans Not Eligible for Partial Claim or Loan Modification



Given that loans can enter COVID-19 forbearance through December 31, 2020, it is theoretically possible for loans to remain in forbearance through the end of 2021. However, based on data from HUD and Black Knight, the number of loans still entering forbearance is small. Therefore, we are assuming that the impact of loans in

forbearance after March, 2021 will be negligible. Also, the treatment of loans exiting COVID-19 forbearance was determined based on data from HUD and Black Knight.

Multinomial Logistic Regression Theory and Model Specification

Multinomial logistic regression is used to model the relationship between a collection of predictor variables and the distributional behavior of a polytomous response variable. It is a likelihood-based methodology and may be viewed as the generalization of logistic regression for a response variable with more than two levels.

To formalize its description, let the response variable Y take m possible levels, denoted for simplicity as 1,…,m, and assume there is a collection of g predictors $X_1,\ldots,X_g$, that are used to model Y's distribution. We assume that Y and $X_1,\ldots,X_g$ are jointly observed n times with the i^{th} random observation being labeled as

$$Y_i, X_{1i},\ldots,X_{gi} \text{ and its realized value } y_i, x_{1i},\ldots,x_{gi}.$$

In a multinomial logistic regression, the mathematical structure of the model is set by the following two assumptions:

1. The g+1 length random vectors $<Y_i, X_{1i},\ldots,X_{gi}>$ are jointly independent across all i
2. Given that $X_{1i},\ldots,X_{gi}$ have been observed at $x_{1i},\ldots,x_{gi}$, Y_i's distribution is assumed to be multinomial with

$$P(Y_i = l) = \exp(\mu^l+\sum_{k=1}^{g}\beta_k^l\cdot x_{ki})/(\sum_{j=1}^{m}\exp(\mu^j+\sum_{k=1}^{g}\beta_k^j\cdot x_{ki})),$$

where the β_k^j are unknown regression parameters and the μ^j are unknown intercept parameters. [Note: To prevent over-specification of the model due to the constraint that the above probabilities sum to 1 over l=1,…,m, a base level j is chosen such that β_k^j and μ^j are set equal to zero.] Thus, if j = 1, then

$$P(Y_i=1) = 1/(1+\sum_{j=2}^{g}\exp(\mu^j+\sum_{k=1}^{g}\beta_k^j\cdot x_{ki})).$$

It now follows the likelihood equation for this model is given by

$$\prod_{i=1}^{n} P(Y_i=y_i) = \prod_{i=1}^{n} \exp(\mu^{y_i}+\sum_{k=1}^{g}\beta_k^{y_i}\cdot x_{ki})/(\sum_{j=1}^{m}\exp(\mu^j+\sum_{k=1}^{g}\beta_k^j\cdot x_{ki})).$$

The multinomial logistic regression procedure optimizes the above likelihood over the unknown parameters in order to find those parameters that are most likely to have given rise to the data.

In the 2017 and 2018 Actuarial Reviews, we used multinomial logistic models to estimate the probability of transition for current and default mortgages. For the 2019 and 2020 Actuarial Reviews, we are using binomial logistic models to predict each transition separately, and once all the binomial models are completed, we compute multinomial probabilities from the binomial models. The primary reason for making this change is that it allows us to better model each transition with the variables that impact that transition, whereas the specific multinomial model structure requires us to include a variable for all transitions even if it is only predictive of one

of the transitions.

The multinomial structure used in the 2017 and 2018 reports did not allow for the use of variables just for individual transitions, if a variable was included in the model it applied to all transitions. This can result in model over-specification, as there are some independent variables that are not significant for some transitions. To address this, Pinnacle used binomial models for each transitions and applied an adjustment to reflect the multinomial nature of the process.

Pinnacle investigated the use of Multinomial Discrete Choice (MDC) models for this analysis. MDC models allow all transitions to be modeled simultaneously, and also allows for the use of independent variables only for specific transitions. Pinnacle compared the MDC approach to the binomial logistic approach, and concluded that the two approaches produce identical model results. We also observed that the MDC approach took significantly longer to complete as it was more computationally intensive. Because the results of the two methods were identical and the binomial logistic models ran more efficiently, we decided to continue with the binomial logistic approach with the multinomial adjustment.

The target variables for the current and default transition models are shown above in Figure 12 and Figure 13. The independent variables used in the models are described in the following section. 31 models were built, 15 for the current (C) transitions and 16 for the Default (D) transitions. Four product groups are modeled: non-SR fixed rate 30-year term (FRM30NSR), SR fixed rate 30-year term (FRM30SR), fixed rate 15-year term (FRM15) and adjustable rate mortgages (ARM). The model development was completed using a train/validate approach. A random sample of the data is used to train the model, to determine inclusion and exclusion of explanatory variables, and to calculate model parameters. The remaining sample, the validation, is used as a final validation step to confirm the predictive power of the final model.

To generate the random sample, random numbers were added to the dataset at the case level using a random number generator. The random numbers were drawn from a uniform distribution between 0 and 1. Based on these random numbers, 60% of the cases were assigned to the train dataset and 40% were assigned to the validation dataset.

There are over 36 million single-family mortgages insured by FHA originated between the first quarter of Fiscal Year 1975 and the fourth quarter of Fiscal Year 2020. For the transition models with the initial condition of C for the FRM30NSR, we used a random sample of 50% of the data. For all other products, we used 100% of the data in the model development.

For transition models with the initial condition of D we used 100% of the data for all ending condition models for all products.

Computation of Multinomial Logistic Probabilities from Binomial Models

As stated above, we compute multinomial probabilities from the binomial models described developed. To arrive at the multinomial logit model for *K* possible outcomes, *K*-1 independent binary logistic regression models

are run and the *Kth* outcome is derived from the *K-1* models. The linear predictor (*lp*) is formulated by a binomial logistic regression for all transitions except for the transition representing remaining in the same state (C_C or D_D), which is the *Kth* outcome. This is consistent with the approach developed by Begg and Gray (1984)[61], in which separate binomial logistic models for each possible transition type are developed, and then the estimates are recombined to derive the multinomial logistic probabilities.

For the C transitions:

$$lp(C\_D) = e^{\alpha^{C\_D} + X^{C\_D}(t)\beta^{C\_D}}$$

$$lp(C\_CXS) = e^{\alpha^{C\_CXS} + X^{C\_CXS}(t)\beta^{C\_CXS}}$$

$$lp(C\_SR) = e^{\alpha^{C\_SR} + X^{C\_SR}(t)\beta^{C\_SR}}$$

$$lp(C\_PRE) = e^{\alpha^{C\_PRE} + X^{C\_PRE}(t)\beta^{C\_PRE}}$$

The probabilities can then be derived for each of the *K-1* transitions:

$$Prob(C\_D) = lp(C\_D) / [1+lp(C\_D)+lp(C\_CXS)+lp(C\_SR)+lp(C\_PRE)]$$

$$Prob(C\_CXS) = lp(C\_CXS) / [1+lp(C\_D)+lp(C\_CXS)+lp(C\_SR)+lp(C\_PRE)]$$

$$Prob(C\_SR) = lp(C\_D) / [1+lp(C\_D)+lp(C\_CXS)+lp(C\_SR)+lp(C\_PRE)]$$

$$Prob(C\_PRE) = lp(C\_D) / [1+lp(C\_D)+lp(C\_CXS)+lp(C\_SR)+lp(C\_PRE)]$$

The *Kth* probability is

$$Prob(C\_C) = 1- Prob(C\_D)- Prob(C\_CXS)- Prob(C\_SR)- Prob(C\_PRE)$$

For the D transitions:

$$lp(D\_CLM) = e^{\alpha^{D\_CLM} + X^{D\_CLM}(t)\beta^{D\_CLM}}$$

[61] Begg, C.B. and R. Gray, "Calculation of Polychotomous Logistic Regression Parameters Using Individualized Regressions," Biometrika, 71(1):11-18, 1984.

$$lp(D\_CXS) = e^{\alpha^{D\_CXS} + X^{D\_CXS}(t)\beta^{D\_CXS}}$$

$$lp(D\_CXM) = e^{\alpha^{D\_CXM} + X^{D\_CXM}(t)\beta^{D\_CXM}}$$

$$lp(D\_END) = e^{\alpha^{D\_END} + X^{D\_END}(t)\beta^{D\_END}}$$

The probabilities can then be derived for each of the *K-1* transitions:

$$Prob(D\_CLM) = lp(D\_CLM) / [1+lp(D\_CLM)+lp(D\_CXS)+lp(D\_CXM)+lp(D\_END)]$$

$$Prob(D\_CXS) = lp(D\_CXS) / [1+lp(D\_CLM)+lp(D\_CXS)+lp(D\_CXM)+lp(D\_END)]$$

$$Prob(D\_CXM)\ l=p(D\_CXM) / [1+lp(D\_CLM)+lp(D\_CXS)+lp(D\_CXM)+lp(D\_END)]$$

$$Prob(D\_END) = lp(D\_END) / [1+lp(D\_CLM)+lp(D\_CXS)+lp(D\_CXM)+lp(D\_END)]$$

The *Kth* probability is

$$Prob(D\_D) = 1- Prob(D\_CLM)- Prob(D\_CXS)- Prob(D\_CXM)- Prob(D\_END)$$

Finally, a check is built into the simulation to assure the sum of all transition probabilities does not exceed 1.0.

Section 2: Transition Model Explanatory Variables

Multiple categories of explanatory variables were considered in development of the transition models.

- Fixed initial mortgage characteristics: market rate, initial mortgage size, spread at origination, refinance indicator
- Fixed initial borrower characteristics: down payment assistance, first-time home buyer, credit score, cohort year
- Property characteristics: the number of living units, initial home values
- Dynamic variables based on mortgage information: prior default indicator, number of prior default episodes, prior mortgage modification, number of prior modifications, LTV ratio, interest rate spread, TEI (expense to income ratio), mortgage period, duration of default episode, time since last default episode
- Dynamic variables derived by combining mortgage information and external economic data: spread, season
- Dynamic macroeconomic variables: average unemployment rate over multiple time periods, change in

the unemployment rate, HPI, change in HPI, treasury rates, GDP measures, slope of yield curve. Consumer Confidence Index, Small Business Confidence Index

- Geographic variables: judicial state, collateral state

The following explanatory variables are used in the transition models. A general description of the variable is provided below, and more specific detail is included in the Model Parameters section.

- **Periodnbr**: the number of quarters since the inception of the mortgage. This variable is incorporated as a piecewise variate and a grouped categorical variable.
- **Refiincent**: refinance incentive - the ratio of the difference in the initial mortgage rate to the current market mortgage rate. This variable is calculated as *(100*mortgage interest rate)/(market FRM30 rate)*. This variable is incorporated as a piecewise variate.
- **Priordef**: number of prior default episodes. This variable is incorporated as a grouped categorical variable and a piecewise variate.
- **Timesinced**: time since most recent default. This variable is incorporated as a grouped categorical variable.
- **Credit**: credit score. This variable is incorporated as a piecewise variate.
- **Ratiotmptei**: front end ratio, the portion of an individual's income allocated to mortgage payments. This variable is incorporated as a piecewise variate.
- **Deltaue**: change in unemployment rate from mortgage inception to current. This variable is incorporated as a piecewise variate.
- **Deltaueprr3**: change in unemployment rate from three quarters prior to current. This variable is incorporated as a piecewise variate.
- **Hpa2yb**: house price appreciation over the past two years. This variable is calculated as (*current hpi_index /hpi_index 8 quarters prior)*. This variable is incorporated as a piecewise variate.
- **LTV**: ratio of the amortized loan balance to the current home value. This variable is incorporated as a piecewise variate.
- **Loanraw**: the initial mortgage amount. This variable is incorporated as a piecewise variate.
- **Frst_tm_by**: first time home buyer. This variable is incorporated as a categorical variable.
- **Season**: the quarter of the year. Possible values are 1 – January through March, 2 – April through June, 3 – July through September, and 4 – October through December. This variable is incorporated as a grouped categorical variable.
- **Rfnc_ind**: an indicator of whether the mortgage was a refinance. This variable is incorporated as a categorical variable.
- **Dpa**: down payment assistance. This variable is incorporated as a categorical variable.
- **Ueblend**: current unemployment rate. This variable is incorporated as a piecewise variate.
- **Ycslope**: yield curve. This variable is incorporated as a grouped categorical variable.
- **Sato**: spread at origination. This variable is calculated as the difference between the prevailing interest rate and the mortgage interest rate at time of origination. This variable is incorporated as a piecewise

variate.

- **Calperiod**: calendar year and quarter. This variable is incorporated as a grouped categorical variable.
- **Judicial**: whether the property is in a judicial state. This variable is incorporated as a categorical variable.
- **Cred_subs_coht**: credit subsidy cohort. This variable is incorporated as a grouped categorical variable.
- **Treasury_yr30**: 30-year CMT rate. This variable is incorporated as a grouped categorical variable.
- **Deltaty1**: change in one-year CMT rate from policy inception to current. This variable is incorporated as a piecewise variate.
- **Deltaty10init**: 10-year CMT rate at policy inception. This variable is incorporated as a grouped categorical variable.
- **Durdefep**: duration of default episode. This variable is incorporated as a grouped categorical variable.

For variables that are incorporated as a piecewise variate, further information is provided on how these variates are specified in the Model Parameter section.

The overall percentage of records in each final condition category for the initial condition of Current is shown in the table below.

Table 28: Distribution of Final Condition – Current Transition Models

Final Condition	Percentage
CXS	0.45%
DCLM	2.45%
CXM	0.01%
SR	0.77%
PRE	2.30%
C	93.98%

The overall percentage of records in each final condition category for the initial condition of Default is shown in the table below.

Table 29: Distribution of Final Condition - Default Transition Models

Final Condition	Percentage
CLM	3.79%
CXM	2.62%

Final Condition	Percentage
CXS	19.80%
END	1.50%
D	72.25%

Section 3: Binomial Model Results

Current Transition Model Parameters – FRM30NSR C_SR

The model parameters for the FRM30NSR current to streamlined refinance transition are shown below.

Table 30: Current to Streamlined Refinance Transition FRM30NSR Model Parameters

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept					-8.6089	0.0542	<.0001
mjudicial	1		Categorical of judicial (judicial state)	judicial = 1 (yes)	-0.1874	0.00149	<.0001
mjudicial	2		Categorical of judicial (judicial state)	base level: else			
mperiodnbr_CSR	L03		Categorical of period_number	period_number <= 3	-0.3538	0.00345	<.0001
mperiodnbr_CSR	L04		Categorical of period_number	period_number = 4	0.358	0.00315	<.0001
mperiodnbr_CSR	L05		Categorical of period_number	period_number = 5	0.366	0.00304	<.0001
mperiodnbr_CSR	L06		Categorical of period_number	period_number = 6	0.265	0.00309	<.0001
mperiodnbr_CSR	L07		Categorical of period_number	period_number = 7	0.1479	0.00316	<.0001
mperiodnbr_CSR	Z08		Categorical of period_number	base level: else			
vperiodnbr_CSR_pw1			Variate piecewise of period_number	median(0,period_number-8,22-8)	-0.0621	0.000273	<.0001
vperiodnbr_CSR_pw2			Variate piecewise of period_number	median(0,period_number-22,39-22)	-0.0654	0.000327	<.0001
vperiodnbr_CSR_pw3			Variate piecewise of period_number	median(0,period_number-39,56-39)	-0.0535	0.000712	<.0001
vperiodnbr_CSR_pw4			Variate piecewise of period_number	median(0,period_number-56,70-56)	-0.0317	0.00173	<.0001
vperiodnbr_CSR_pw5			Variate piecewise of period_number	median(0,period_number-70,88-70)	-0.0655	0.00275	<.0001
vrefiincent_CSR_pw1			Variate piecewise of refi_incent2_r[13] (refinance incentive)	median(0,refi_incent_r-0,93-0)	-0.00362	0.000522	<.0001
vrefiincent_CSR_pw2			Variate piecewise of refi_incent2_r[13] (refinance incentive)	median(93,refi_incent_r-113,113-93)	0.1117	0.000227	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
vrefiincent_CSR_pw3			Variate piecewise of refi_incent2_r[13] (refinance incentive)	median(0,refi_incent2_r-113,130-113)	0.068	0.000145	<.0001
vrefiincent_CSR_pw4			Variate piecewise of refi_incent2_r[13] (refinance incentive)	median(0,refi_incent2_r-130,180-130)	0.0185	0.000084	<.0001
vrefiincent_CSR_pw5			Variate piecewise of refi_incent2_r[13] (refinance incentive)	median(0,refi_incent2_r-180,250-180)	-0.00548	0.00034	<.0001
mpriordef_csr*mtimesinceD_CSR	L01	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time <= 1	-0.8973	0.00841	<.0001
mpriordef_csr*mtimesinceD_CSR	L01	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 2	-0.8052	0.00943	<.0001
mpriordef_csr*mtimesinceD_CSR	L01	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 3	-0.6376	0.01	<.0001
mpriordef_csr*mtimesinceD_CSR	L01	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 4	-0.2879	0.00961	<.0001
mpriordef_csr*mtimesinceD_CSR	L01	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 5	-0.2371	0.0104	<.0001
mpriordef_csr*mtimesinceD_CSR	L01	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 6	-0.2721	0.0114	<.0001
mpriordef_csr*mtimesinceD_CSR	L01	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1;7 <= cx_time <= 9	-0.2075	0.00754	<.0001
mpriordef_csr*mtimesinceD_CSR	L01	L09	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time >= 9	-0.0945	0.00724	<.0001
mpriordef_csr*mtimesinceD_CSR	L02	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time <= 1	-1.5376	0.0164	<.0001
mpriordef_csr*mtimesinceD_CSR	L02	L02	Interaction of categorical of	prior_default_cnt = 2; cx_time = 2	-1.328	0.018	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			prior_default_cnt and categorical of cx_time[1]				
mpriordef_csr*mtimesinceD_CSR	L02	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 3	-0.9741	0.018	<.0001
mpriordef_csr*mtimesinceD_CSR	L02	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 4	-0.4305	0.0159	<.0001
mpriordef_csr*mtimesinceD_CSR	L02	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 5	-0.2698	0.0165	<.0001
mpriordef_csr*mtimesinceD_CSR	L02	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 6	-0.282	0.0184	<.0001
mpriordef_csr*mtimesinceD_CSR	L02	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2;7 <= cx_time <= 9	-0.2642	0.0126	<.0001
mpriordef_csr*mtimesinceD_CSR	L02	L09	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time >= 9	-0.1541	0.0104	<.0001
mpriordef_csr*mtimesinceD_CSR	L03	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time <= 1	-1.8959	0.0154	<.0001
mpriordef_csr*mtimesinceD_CSR	L03	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 2	-1.4955	0.0158	<.0001
mpriordef_csr*mtimesinceD_CSR	L03	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 3	-0.9936	0.0151	<.0001
mpriordef_csr*mtimesinceD_CSR	L03	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 4	-0.2935	0.0129	<.0001
mpriordef_csr*mtimesinceD_CSR	L03	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 5	-0.1482	0.0137	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mpriordef_csr*mtimesinceD_CSR	L03	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 6	-0.1926	0.0156	<.0001
mpriordef_csr*mtimesinceD_CSR	L03	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; 7 <= cx_time <= 9	-0.2127	0.0115	<.0001
mpriordef_csr*mtimesinceD_CSR	L03	L09	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time >= 9	-0.1965	0.0106	<.0001
mpriordef_csr*mtimesinceD_CSR	Z00	Z00	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	base level prior_default_cnt = 0; base level prior_default_cnt = 0			
vpriordef_CSR_pw1			Variate piecewise of prior_default_cnt	median(0,prior_default_cnt-3,15-3)	0.082	0.00249	<.0001
vcredit_CSR_pw1			Variate piecewise of credit_score	median(0,credit_score-500,650-500)	-0.00378	0.000018	<.0001
vcredit_CSR_pw2			Variate piecewise of credit_score	median(0,credit_score-650,680-650)	0.00236	0.000107	<.0001
vcredit_CSR_pw3			Variate piecewise of credit_score	median(0,credit_score-680,720-680)	-0.00278	0.0001	<.0001
vcredit_CSR_pw4			Variate piecewise of credit_score	median(0,credit_score-720,800-720)	-0.00185	0.000068	<.0001
mRatioTmpTei_CSR	L00		Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	1.0086	0.00519	<.0001
mRatioTmpTei_CSR	Z00		Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_CSR_pw1			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-11,18-11)	0.0246	0.000684	<.0001
vratiotmptei_CSR_pw2			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-18,22-18)	0.0119	0.000811	<.0001
vratiotmptei_CSR_pw3			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-22,29-22)	0.00264	0.000408	<.0001
vratiotmptei_CSR_pw4			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-29,37-29)	-0.00256	0.000332	<.0001
vtimesinced_CSR_pw1			Variate piecwise of cx_time[1]	median(0,cx_time-9,40-7)	0.00947	0.000683	<.0001
vdeltaUEinit_CSR_pw1			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-0,60-0)	-0.00349	0.000345	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
vdeltaUEinit_CSR_pw2			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-60,77-60)	0.0231	0.000279	<.0001
vdeltaUEinit_CSR_pw3			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-77,100-77)	-0.0042	0.000162	<.0001
vdeltaUEinit_CSR_pw4			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-100,105-100)	0.0861	0.000621	<.0001
vdeltaUEinit_CSR_pw5			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-105,145-105)	0.00952	0.000084	<.0001
vdeltaUEinit_CSR_pw6			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-145,225-145)	-0.00098	0.000061	<.0001
vhpa2yb_CSR_pw1			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-0,85-0)	0.0119	0.000116	<.0001
vhpa2yb_CSR_pw2			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-85,100-85)	-0.0188	0.000272	<.0001
vhpa2yb_CSR_pw3			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-100,106-100)	0.1175	0.000523	<.0001
vhpa2yb_CSR_pw4			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-106,111-106)	-0.0102	0.000569	<.0001
vhpa2yb_CSR_pw5			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-111,122-111)	0.00569	0.000305	<.0001
vhpa2yb_CSR_pw6			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-122,160-122)	-0.026	0.00032	<.0001
vltv_CSR_pw1			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-0,70-0)	-0.00438	0.000265	<.0001
vltv_CSR_pw2			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-70,80-70)	0.0311	0.000601	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
vltv_CSR_pw3			Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-80,89-80)	0.00595	0.000464	<.0001
vltv_CSR_pw4			Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-89,93-89)	-0.0333	0.000812	<.0001
vltv_CSR_pw5			Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-93,95-93)	0.0283	0.00143	<.0001
vltv_CSR_pw6			Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-95,97-95)	0.1424	0.00166	<.0001
vltv_CSR_pw7			Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-97,100-97)	-0.1794	0.00498	<.0001
vloanraw_CSR_pw1			Variate piecewise of loansize_raw	median(0,loansize_raw-47000,74000-47000)	0.000046	1.71E-07	<.0001
vloanraw_CSR_pw2			Variate piecewise of loansize_raw	median(0,loansize_raw-74000,159000-74000)	0.000011	3.11E-08	<.0001
vloanraw_CSR_pw3			Variate piecewise of loansize_raw	median(0,loansize_raw-159000,345000-159000)	4.53E-06	1.77E-08	<.0001
vloanraw_CSR_pw4			Variate piecewise of loansize_raw	median(0,loansize_raw-345000,600000-345000)	2.34E-07	3.04E-08	<.0001
mfrst_tm_by	1		Categorical of frst_tm_by (first-time buyer)	frst_tm_by = "Y"	-0.2082	0.00156	<.0001
	2		Categorical of frst_tm_by (first-time buyer)	base level: else			
mDeltaTY1Init_CSR	L01		Categorical of DeltaTy1Init (Change in 1 yr Treasury policy inception to current)	DeltaTY1Init > 1.15	0.3492	0.00217	<.0001
mDeltaTY1Init_CSR	Z00		Categorical of DeltaTy1Init (Change in 1 yr Treasury policy inception to current)	base level: else			

Current Transition Model Parameters – FRM30NSR C_PRE

The model parameters for the FRM30NSR current to prepayment transition are shown below.

Table 31: Current to Prepayment Transition FRM30NSR Model Parameters

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept					-6.6377	0.013	<.0001
mseason	1		Categorical of season	season = "winter"	-0.1625	0.00137	<.0001
mseason	2		Categorical of season	season = "spring"	0.0866	0.00129	<.0001
mseason	3		Categorical of season	season = "summer"	0.0723	0.00128	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mseason	4		Categorical of season	base level: season = "fall"			
mfrst_tm_by	1		Categorical of frst_tm_by (first-time buyer)	frst_tm_by = "Y"	-0.1433	0.00116	<.0001
mfrst_tm_by	2		Categorical of frst_tm_by (first-time buyer)	base level: else			
mrfnc_ind	2		Categorical of rfnc_ind (refinanced loan indicator)	rfnc_ind = "N"	-0.0678	0.00386	<.0001
mrfnc_ind	3		Categorical of rfnc_ind (refinanced loan indicator)	base level: else			
mdpa_govt	LGovt		Categorical of dpa (down payment assistance)	dpa = "govt"	-0.1034	0.00428	<.0001
mdpa_govt	ZOthr		Categorical of dpa (down payment assistance)	base level: else			
mdpa_rel	LRela		Categorical of dpa (down payment assistance)	dpa = "Relative"	0.0503	0.0014	<.0001
mdpa_rel	ZOthr		Categorical of dpa (down payment assistance)	base level: else			
mperiodnbr_CPre	L02		Categorical of period_number	period_number = 2	-2.7089	0.00817	<.0001
mperiodnbr_CPre	L03		Categorical of period_number	period_number = 3	-1.689	0.00521	<.0001
mperiodnbr_CPre	L04		Categorical of period_number	period_number = 4	-1.1247	0.00407	<.0001
mperiodnbr_CPre	L05		Categorical of period_number	period_number = 5	-0.6254	0.00332	<.0001
mperiodnbr_CPre	L06		Categorical of period_number	period_number = 6	-0.3712	0.00303	<.0001
mperiodnbr_CPre	L07		Categorical of period_number	period_number = 7	-0.24	0.00289	<.0001
mperiodnbr_CPre	Z08		Categorical of period_number	base level: else			
vperiodnbr_CPre_pw1			Variate piecewise of period_number	median(0,period_number-8,22-8)	0.0206	0.000175	<.0001
vperiodnbr_CPre_pw2			Variate piecewise of period_number	median(0,period_number-22,35-22)	-0.0107	0.000204	<.0001
vperiodnbr_CPre_pw3			Variate piecewise of period_number	median(0,period_number-35,42-35)	0.00445	0.000487	<.0001
vperiodnbr_CPre_pw4			Variate piecewise of period_number	median(0,period_number-42,70-42)	-0.0272	0.000222	<.0001
vperiodnbr_CPre_pw5			Variate piecewise of period_number	median(0,period_number-70,108-70)	0.00943	0.000349	<.0001
mperiodnbr_CPre*mrfnc_ind	L02	2	Interaction of categorical of period_number and categorical of rfnc_ind	period_number = 2; rfnc_ind = "N"	1.094	0.0137	<.0001
mperiodnbr_CPre*mrfnc_ind	L03	2	Interaction of categorical of	period_number = 3; rfnc_ind = "N"	1.0166	0.00931	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			period_number and categorical of rfnc_ind				
mperiodnbr_CPre*mrfnc_ind	L04	2	Interaction of categorical of period_number and categorical of rfnc_ind	period_number = 4; rfnc_ind = "N"	0.7846	0.00821	<.0001
mperiodnbr_CPre*mrfnc_ind	L05	2	Interaction of categorical of period_number and categorical of rfnc_ind	period_number = 5; rfnc_ind = "N"	0.4469	0.00773	<.0001
mperiodnbr_CPre*mrfnc_ind	L06	2	Interaction of categorical of period_number and categorical of rfnc_ind	period_number = 6; rfnc_ind = "N"	0.2738	0.00767	<.0001
mperiodnbr_CPre*mrfnc_ind	L07	2	Interaction of categorical of period_number and categorical of rfnc_ind	period_number = 7; rfnc_ind = "N"	0.1793	0.00773	<.0001
mperiodnbr_CPre*mrfnc_ind	Z08	3	Interaction of categorical of period_number and categorical of rfnc_ind	base level: period_number else; rfnc_ind else			
vperiodnbr_CPre_pw1*mrfnc_ind	2		Interaction of variate of period_number and categorical of rfnc_ind	median(0,period_number-8,22-8); rfnc_ind = "N"	-0.0313	0.000444	<.0001
vperiodnbr_CPre_pw2*mrfnc_ind	2		Interaction of variate of period_number and categorical of rfnc_ind	median(0,period_number-22,35-22); rfnc_ind = "N"	-0.00621	0.000621	<.0001
vperiodnbr_CPre_pw3*mrfnc_ind	2		Interaction of variate of period_number and categorical of rfnc_ind	median(0,period_number-35, 42-35); rfnc_ind = "N"	-0.0229	0.00167	<.0001
vperiodnbr_CPre_pw4*mrfnc_ind	2		Interaction of variate of period_number and categorical of rfnc_ind	median(0,period_number-42, 70-42); rfnc_ind = "N"	0.0167	0.000862	<.0001
vperiodnbr_CPre_pw5*mrfnc_ind	2		Interaction of variate of period_number and categorical of rfnc_ind	median(0,period_number-70, 108-70); rfnc_ind = "N"	0.006	0.00245	0.0144
vperiodnbr_CPre_pw*mrfnc_ind	3		Interaction of variate of period_number and categorical of rfnc_ind	base level period_number piecewise; rfnc_ind else			

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
vcredit_CPre_pw1			Variate piecewise of credit_score	median(0,credit_score-450,530-450)	-0.0109	0.000082	<.0001
vcredit_CPre_pw2			Variate piecewise of credit_score	median(0,credit_score-530,630-530)	0.000928	0.000073	<.0001
vcredit_CPre_pw3			Variate piecewise of credit_score	median(0,credit_score-630,680-630)	0.00535	0.00006	<.0001
vcredit_CPre_pw4			Variate piecewise of credit_score	median(0,credit_score-680,720-680)	0.00276	0.000075	<.0001
vcredit_CPre_pw5			Variate piecewise of credit_score	median(0,credit_score-720,760-720)	0.00169	0.000089	<.0001
vcredit_CPre_pw6			Variate piecewise of credit_score	median(0,credit_score-760,800-760)	-0.00074	0.000115	<.0001
vhpa2yb_CPre_pw1			Variate piecewise of hpa2y_blended_r[6] (2 year house price appreciation)	median(0,hpa2y_blended_r-85,100-85)	0.0363	0.000334	<.0001
vhpa2yb_CPre_pw2			Variate piecewise of hpa2y_blended_r[6] (2 year house price appreciation)	median(0,hpa2y_blended_r-100,106-100)	0.099	0.000471	<.0001
vhpa2yb_CPre_pw3			Variate piecewise of hpa2y_blended_r[6] (2 year house price appreciation)	median(0,hpa2y_blended_r-106,111-106)	0.0352	0.000364	<.0001
vhpa2yb_CPre_pw4			Variate piecewise of hpa2y_blended_r[6] (2 year house price appreciation)	median(0,hpa2y_blended_r-111,122-111)	0.0335	0.00017	<.0001
vhpa2yb_CPre_pw5			Variate piecewise of hpa2y_blended_r[6] (2 year house price appreciation)	median(0,hpa2y_blended_r-122,150-122)	0.0335	0.000117	<.0001
vltv_CPRE_pw1			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-0,78-0)	-0.00681	0.000104	<.0001
vltv_CPRE_pw2			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-78,85-78)	0.00883	0.00038	<.0001
vltv_CPRE_pw3			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-85,87-85)	-0.0141	0.00119	<.0001
vltv_CPRE_pw4			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-87,91-87)	-0.0322	0.000579	<.0001
vltv_CPRE_pw5			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-91,94-91)	-0.0575	0.000704	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
vltv_CPRE_pw6			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-94,100-94)	-0.00175	0.000945	0.0643
vueblend_CPre_pw1			Variate piecewise of ue_blended_r[8] (unemployment rate)	(0,ue_blended_r-0,450-0)	-0.00087	9.56E-06	<.0001
vueblend_CPre_pw3			Variate piecewise of ue_blended_r[8] (unemployment rate)	(0,ue_blended_r-700,730-700)	-0.00539	0.000085	<.0001
vueblend_CPre_pw4			Variate piecewise of ue_blended_r[8] (unemployment rate)	(0,ue_blended_r-730, 1000-730)	-0.00101	0.000014	<.0001
vrefiincent_CPre_pw1			Variate piecewise of refi_incent2_r[13] (refinance incentive)	median(0,refi_incent_r-0,115-0)	0.0245	0.000059	<.0001
vrefiincent_CPre_pw2			Variate piecewise of refi_incent2_r[13] (refinance incentive)	median(115,refi_incent_r-115,150-115)	0.00796	0.000059	<.0001
vrefiincent_CPre_pw3			Variate piecewise of refi_incent2_r[13] (refinance incentive)	median(150,refi_incent_r-150,200-150)	-0.00927	0.000105	<.0001
vratiotmptei_CPre_pw1			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,5-0)	0.0294	0.000753	<.0001
vratiotmptei_CPre_pw2			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-5,18-5)	-0.0168	0.000256	<.0001
vratiotmptei_CPre_pw3			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-18,47-18)	-0.0101	0.000078	<.0001
vratiotmptei_CPre_pw4			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-47,100-47)	0.00495	0.000349	<.0001
vdeltaUEinit_CPre_pw1			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-0,88-0)	0.00401	0.000054	<.0001
vdeltaUEinit_CPre_pw2			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-88,96-88)	0.01	0.00033	<.0001
vdeltaUEinit_CPre_pw3			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy	median(0,deltaUEinit_r-96,100-96)	0.00638	0.000742	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			inception to current)				
vdeltaUEinit_CPre_pw4			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-100,126-100)	0.00989	0.000103	<.0001
vdeltaUEinit_CPre_pw5			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-126,200-126)	0.00387	0.000045	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L01	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time <= 1	-0.3604	0.00548	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L01	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 2	-0.423	0.00626	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L01	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 3	-0.4063	0.00677	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L01	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 4	-0.3209	0.00699	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L01	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 5	-0.3101	0.00735	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L01	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 6	-0.3007	0.00779	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L01	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time <= 7	-0.2733	0.00399	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L02	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time <= 1	-0.5567	0.00808	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L02	L02	Interaction of categorical of prior_default_cnt	prior_default_cnt = 2; cx_time = 2	-0.6267	0.00975	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			and categorical of cx_time[1]				
mpriordef_cpre*mtimesinceD_CPRE	L02	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 3	-0.5928	0.0109	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L02	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 4	-0.4662	0.0114	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L02	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 5	-0.4512	0.0123	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L02	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 6	-0.4505	0.0133	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L02	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time <= 7	-0.4365	0.00553	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L03	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time <= 1	-0.7787	0.0062	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L03	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 2	-0.8411	0.00778	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L03	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 3	-0.7777	0.00891	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L03	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 4	-0.6544	0.00958	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L03	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 5	-0.5845	0.0102	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L03	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 6	-0.571	0.0112	<.0001
mpriordef_cpre*mtimesinceD_CPRE	L03	L07	Interaction of categorical of	prior_default_cnt >= 3; cx_time <= 7	-0.5524	0.00518	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			prior_default_cnt and categorical of cx_time[1]				
mpriordef_cpre*mtimesinceD_CPRE	Z00	Z00	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	base level prior_default_cnt = 0; base level prior_default_cnt = 0			
vtimesinced_CPre_pw1			Variate piecewise of prior_default_cnt	median(0,cx_time-7,19-7)	0.00547	0.00053	<.0001
vtimesinced_CPre_pw2			Variate piecewise of prior_default_cnt	median(0,cx_time-19,35-19)	0.00312	0.000587	<.0001
vloanraw_CPRE_pw1			Variate piecewise of loansize_raw	median(0,loansize_raw-0,57000-0)	0.000011	1.11E-07	<.0001
vloanraw_CPRE_pw2			Variate piecewise of loansize_raw	median(0,loansize_raw-57000,159000-57000)	5.99E-06	1.81E-08	<.0001
vloanraw_CPRE_pw3			Variate piecewise of loansize_raw	median(0,loansize_raw-159000,345000-159000)	2.73E-06	1.49E-08	<.0001
vloanraw_CPRE_pw4			Variate piecewise of loansize_raw	median(0,loansize_raw-345000,600000-345000)	1.80E-06	2.51E-08	<.0001
mDeltaTY1Init_CPRE	L01		Categorical of DeltaTy1Init (Change in 1 yr Treasury policy inception to current)	DeltaTy1Init < 0.17	-0.5367	0.00257	<.0001
mDeltaTY1Init_CPRE	L02		Categorical of DeltaTy1Init (Change in 1 yr Treasury policy inception to current)	DeltaTY1Init > 2.30	0.1908	0.00151	<.0001
mDeltaTY1Init_CPRE	Z00		Categorical of DeltaTy1Init (Change in 1 yr Treasury policy inception to current)	base level: else			

Current Transition Model Parameters – FRM30NSR C_CXS

The model parameters for the FRM30NSR current to self-cure transition are shown below.

Table 32: Current to Self-Cure Transition FRM30NSR Model Parameters

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept					-3.8506	0.013	<.0001
mseason	1		Categorical of season	season = "winter"	0.3593	0.00227	<.0001
mseason	2		Categorical of season	season = "spring"	-0.1364	0.00247	<.0001
mseason	3		Categorical of season	season = "summer"	0.0936	0.00239	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mseason	4		Categorical of season	base level: season = "fall"			
mfrst_tm_by	1		Categorical of frst_tm_by (first-time buyer)	frst_tm_by = "Y"	0.0648	0.00188	<.0001
mfrst_tm_by	2		Categorical of frst_tm_by (first-time buyer)	base level: else			
mdpa_govt	LGovt		Categorical of dpa (down payment assistance)	dpa = "govt"	0.0896	0.00516	<.0001
mdpa_govt	ZOthr		Categorical of dpa (down payment assistance)	base level: else			
mdpa_rel	LRela		Categorical of dpa (down payment assistance)	dpa = "Relative"	0.0875	0.00217	<.0001
mdpa_rel	ZOthr		Categorical of dpa (down payment assistance)	base level: else			
mcalperiod_CCXS	L200604		Categorical of Calendar Period	if period < 200604 then mcalperiod_CCXS = "L200604"	-2.4253	0.00501	<.0001
mcalperiod_CCXS	Z		Categorical of Calendar Period	base level: else			
vpriordef_CCXS_pw1			Variate piecewise of prior_default_cnt	median(0,prior_default_cnt-3,15-3)	0.1077	0.000623	<.0001
mperiodnbr_cCXS	L02		Categorical of period_number	period_number = 2	-0.1175	0.00561	<.0001
mperiodnbr_cCXS	L03		Categorical of period_number	period_number = 3	0.1296	0.00501	<.0001
mperiodnbr_cCXS	L04		Categorical of period_number	period_number = 4	0.1751	0.00481	<.0001
mperiodnbr_cCXS	L05		Categorical of period_number	period_number = 5	0.1716	0.00478	<.0001
mperiodnbr_cCXS	L06		Categorical of period_number	period_number = 6	0.1857	0.00466	<.0001
mperiodnbr_cCXS	L07		Categorical of period_number	period_number = 7	0.1091	0.00473	<.0001
mperiodnbr_cCXS	Z08		Categorical of period_number	base level: else			
vperiodnbr_CCXS_pw1			Variate piecewise of period_number	median(0,period_number-8,36-8)	-0.0248	0.000145	<.0001
vperiodnbr_CCXS_pw2			Variate piecewise of period_number	median(0,period_number-36,53-36)	-0.0133	0.000293	<.0001
vperiodnbr_CCXS_pw3			Variate piecewise of period_number	median(0,period_number-53,76-53)	-0.0123	0.000356	<.0001
vperiodnbr_CCXS_pw4			Variate piecewise of period_number	median(0,period_number-76,86-76)	-0.0141	0.00103	<.0001
vcredit_CCXS_pw1			Variate piecewise of credit_score	median(0,credit_score-450,500-450)	-0.00096	0.00012	<.0001
vcredit_CCXS_pw2			Variate piecewise of credit_score	median(0,credit_score-500,630-500)	-0.00028	0.000051	<.0001
vcredit_CCXS_pw3			Variate piecewise of credit_score	median(0,credit_score-630,680-630)	-0.00646	0.000063	<.0001
vcredit_CCXS_pw4			Variate piecewise of credit_score	median(0,credit_score-680,800-680)	-0.00867	0.000053	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mRatioTmpTei_CCXS	L00		Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	0.1904	0.00956	<.0001
mRatioTmpTei_CCXS	Z00		Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_CCXS_pw1			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-5,30-5)	0.00873	0.000164	<.0001
vratiotmptei_CCXS_pw2			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-30,45-30)	0.00287	0.000272	<.0001
vratiotmptei_CCXS_pw3			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-45,57-45)	-0.0102	0.00208	<.0001
vhpa2yb_CCXS_pw1			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-90,105-90)	0.00957	0.00023	<.0001
vhpa2yb_CCXS_pw2			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-105,117-105)	0.00161	0.000258	<.0001
vhpa2yb_CCXS_pw3			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-117,125-117)	-0.00925	0.000609	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L01	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time <= 1	2.4026	0.00354	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L01	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 2	2.1352	0.00449	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L01	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 3	1.849	0.00572	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L01	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 4	1.7271	0.00662	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L01	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 5	1.3752	0.00861	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L01	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 6	1.2114	0.01	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L01	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 7	1.1687	0.011	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mpriordef_ccxs*mtimesinceD_CCXS	L01	L08	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time >= 8	1.1585	0.00713	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L02	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time <= 1	2.8387	0.00412	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L02	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 2	2.5664	0.0054	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L02	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 3	2.2554	0.00715	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L02	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 4	2.1172	0.00852	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L02	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 5	1.7547	0.0113	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L02	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 6	1.5833	0.0134	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L02	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 7	1.5204	0.015	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L02	L08	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time >= 8	1.3836	0.00888	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L03	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time <= 1	3.1201	0.00331	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L03	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 2	2.7787	0.00401	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L03	L03	Interaction of categorical of prior_default_cnt	prior_default_cnt >= 3; cx_time = 3	2.421	0.00508	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			and categorical of cx_time[1]				
mpriordef_ccxs*mtimesinceD_CCXS	L03	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 4	2.2679	0.00599	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L03	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 5	1.8554	0.00795	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L03	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 6	1.6652	0.00947	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L03	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 7	1.564	0.0109	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	L03	L08	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time >= 8	1.386	0.00761	<.0001
mpriordef_ccxs*mtimesinceD_CCXS	Z00	Z00	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	base level prior_default_cnt = 0; base level prior_default_cnt = 0			
vtimesinced_CCXS_pw1			Variate piecwise of cx_time[1]	median(0,cx_time-8,13-8)	-0.0893	0.00186	<.0001
vtimesinced_CCXS_pw2			Variate piecwise of cx_time[1]	median(0,cx_time-13,40-13)	-0.0221	0.000705	<.0001
vloanraw_CCXS_pw1			Variate piecewise of loansize_raw	median(0,loansize_raw-0,57000-0)	-9.24E-06	2.14E-07	<.0001
vloanraw_CCXS_pw2			Variate piecewise of loansize_raw	median(0,loansize_raw-57000,159000-57000)	-2.42E-06	2.70E-08	<.0001
vdeltaUEinit_CCXS_pw1			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-45,100-45)	0.000246	0.000065	0.0002
vdeltaUEinit_CCXS_pw2			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-100,200-100)	0.00141	0.000037	<.0001

Current Transition Model Parameters – FRM30NSR C_D

The model parameters for the FRM30NSR current to default transition are shown below.

Table 33: Current to Default Transition FRM30NSR Model Parameters

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept					-3.0984	0.0103	<.0001
mseason	1		Categorical of season	season = "winter"	-0.2545	0.00117	<.0001
mseason	2		Categorical of season	season = "spring"	-0.4076	0.00118	<.0001
mseason	3		Categorical of season	season = "summer"	-0.1892	0.00113	<.0001
mseason	4		Categorical of season	base level: season = "fall"			
mjudicial	1		Categorical of judicial (judicial state)	judicial = 1 (yes)	0.0413	0.000869	<.0001
mjudicial	2		Categorical of judicial (judicial state)	base level: else			
mycslope_CD	L01		Categorical of ycslope_r^9 (Yield Curve Slope)	100<=ycslope_r^9<=200	0.0278	0.000992	<.0001
mycslope_CD	Z00		Categorical of ycslope_r^9 (Yield Curve Slope)	base level: else			
mfrst_tm_by	1		Categorical of frst_tm_by (first-time buyer)	frst_tm_by = "Y"	0.0676	0.0012	<.0001
mfrst_tm_by	2		Categorical of frst_tm_by (first-time buyer)	base level: else			
mrfnc_ind	2		Categorical of rfnc_ind (refinanced loan indicator)	rfnc_ind = "N"	0.0783	0.0017	<.0001
mrfnc_ind	3		Categorical of rfnc_ind (refinanced loan indicator)	base level: else			
mcalperiod_CD	L200604		Categorical of Calendar Period	period < 200604	-0.9721	0.00186	<.0001
mcalperiod_CD	Z		Categorical of Calendar Period	base level: else			
mperiodnbr_CD	L02		Categorical of period_number	period_number = 2	-0.4396	0.00282	<.0001
mperiodnbr_CD	L03		Categorical of period_number	period_number = 3	-0.0512	0.00252	<.0001
mperiodnbr_CD	L04		Categorical of period_number	period_number = 4	0.0376	0.00251	<.0001
mperiodnbr_CD	L05		Categorical of period_number	period_number = 5	0.0783	0.00253	<.0001
mperiodnbr_CD	L06		Categorical of period_number	period_number = 6	0.0963	0.00257	<.0001
mperiodnbr_CD	L07		Categorical of period_number	period_number = 7	0.0636	0.00269	<.0001
mperiodnbr_CD	Z08		Categorical of period_number	base level: else			
vperiodnbr_CD_pw1			Variate piecewise of period_number	median(0,period_number-8,40-8)	-0.0212	0.000109	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
vperiodnbr_CD_pw2			Variate piecewise of period_number	median(0,period_number-40,53-40)	-0.00978	0.000246	<.0001
vperiodnbr_CD_pw3			Variate piecewise of period_number	median(0,period_number-53,68-53)	-0.0225	0.000726	<.0001
vperiodnbr_CD_pw4			Variate piecewise of period_number	median(0,period_number-68,108-68)	-0.0141	0.000878	<.0001
vcredit_CD_pw1			Variate piecewise of credit_score	median(0,credit_score-450,530-450)	0.00262	0.000034	<.0001
vcredit_CD_pw2			Variate piecewise of credit_score	median(0,credit_score-530,630-530)	-0.00289	0.00003	<.0001
vcredit_CD_pw3			Variate piecewise of credit_score	median(0,credit_score-630,680-630)	-0.00924	0.000039	<.0001
vcredit_CD_pw4			Variate piecewise of credit_score	median(0,credit_score-680,720-680)	-0.0102	0.000072	<.0001
vcredit_CD_pw5			Variate piecewise of credit_score	median(0,credit_score-720,760-720)	-0.00836	0.000115	<.0001
vcredit_CD_pw6			Variate piecewise of credit_score	median(0,credit_score-760,800-760)	-0.0113	0.000193	<.0001
vdeltaUEinit_CD_pw1			Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-50,100-50)	0.00303	0.000036	<.0001
vdeltaUEinit_CD_pw2			Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-100,200-100)	0.00284	0.00002	<.0001
mRatioTmpTei_cd	L00		Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	0.411	0.00441	<.0001
mRatioTmpTei_cd	Z00		Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_CD_pw1			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,24-0)	0.0184	0.000131	<.0001
vratiotmptei_CD_pw2			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-24,36-24)	0.0108	0.000113	<.0001
vpriordef_CD_pw1			Variate piecewise of prior_default_cnt	median(0,prior_default_cnt-3,15-3)	0.0716	0.000409	<.0001
mperiodnbr_CD*mpriordef_ind	L02	L01	Interaction of categorical period number and categorical prior default count	period number =2; prior_default_cnt NE 0	-1.4404	0.1832	<.0001
mperiodnbr_CD*mpriordef_ind	L03	L01	Interaction of categorical period number and categorical prior default count	period number =3; prior_default_cnt NE 0	-0.5828	0.0121	<.0001
mperiodnbr_CD*mpriordef_ind	L04	L01	Interaction of categorical period	period number =4; prior_default_cnt NE 0	-0.2759	0.00717	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			number and categorical prior default count				
mperiodnbr_CD*mpriordef_ind	L05	L01	Interaction of categorical period number and categorical prior default count	period number =5; prior_default_cnt NE 0	-0.1573	0.00576	<.0001
mperiodnbr_CD*mpriordef_ind	L06	L01	Interaction of categorical period number and categorical prior default count	period number =6; prior_default_cnt NE 0	-0.0846	0.00518	<.0001
mperiodnbr_CD*mpriordef_ind	L07	L01	Interaction of categorical period number and categorical prior default count	period number =7; prior_default_cnt NE 0	-0.0444	0.00496	<.0001
mperiodnbr_CD*mpriordef_ind	Z08	Z00	Interaction of categorical period number and categorical prior default count	base level: period number = else; prior_default_cnt = else			
vperiodnbr_CD_pw1*mpriordef_ind	L01		Interaction of variate of piecewise of period_number and categorical of prior_default_cnt	period number piecewise; prior_default_cnt NE 0	0.00564	0.00012	<.0001
vperiodnbr_CD_pw3*mpriordef_ind	L01		Interaction of variate of piecewise of period_number and categorical of prior_default_cnt	period number piecewise; prior_default_cnt NE 0	0.0163	0.000726	<.0001
vperiodnbr_CD_pw4*mpriordef_ind	L01		Interaction of variate of piecewise of period_number and categorical of prior_default_cnt	period number piecewise; prior_default_cnt NE 0	0.0147	0.000896	<.0001
vperiodnbr_CD_pw*mpriordef_ind	Z00		Interaction of variate of piecewise of period_number and categorical of prior_default_cnt	period number piecewise; base prior_default_cnt else			
vsato_cd_pw1			Variate piecewise of sato (spread at origination)	median(0,sato-(-2.5),-.1-(-2.5))	0.0174	0.0017	<.0001
vsato_cd_pw2			Variate piecewise of sato (spread at origination)	median(0,sato-(-.1),.7-(-.1))	0.2952	0.00174	<.0001
vsato_cd_pw3			Variate piecewise of sato (spread at origination)	median(0,sato-.7,2.5-.7)	0.2613	0.00307	<.0001
vltv_CD_pw1			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-25,70-25)	0.0039	0.000159	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
vltv_CD_pw2			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-70,88-70)	0.00692	0.00014	<.0001
vltv_CD_pw3			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-88,97-88)	0.024	0.000242	<.0001
mhpa2yb_CD	L00		Categorical of hpa2y_blended_r[6]	hpa2y_blended_r = 0	-1.4105	0.0109	<.0001
mhpa2yb_CD	Z00		Categorical of hpa2y_blended_r[6]	base level: else			
vhpa2yb_CD_pw1			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-50,85-50)	-0.0102	0.000191	<.0001
vhpa2yb_CD_pw2			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-85,100-85)	-0.0071	0.00015	<.0001
vhpa2yb_CD_pw3			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-100,125-100)	-0.00203	0.000074	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time <= 1	2.5023	0.00237	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 2	2.2412	0.00265	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 3	1.9979	0.00305	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 4	1.6817	0.00367	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 5	1.4861	0.00426	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 6	1.3296	0.00484	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 7	1.239	0.00539	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L08	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time >= 8	1.0607	0.00351	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mpriordef_CD*mtimesinceD_CD	L02	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time <= 1	2.8761	0.00267	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 2	2.6083	0.00323	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 3	2.3777	0.0039	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 4	2.0497	0.00485	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 5	1.8308	0.00578	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 6	1.649	0.00673	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 7	1.5318	0.00764	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L08	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time >= 8	1.2525	0.00455	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time <= 1	3.1059	0.00249	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 2	2.8098	0.00281	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 3	2.5547	0.00322	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L04	Interaction of categorical of prior_default_cnt	prior_default_cnt >= 3; cx_time = 4	2.1901	0.00385	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			and categorical of cx_time[1]				
mpriordef_CD*mtimesinceD_CD	L03	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 5	1.945	0.00451	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 6	1.7462	0.0052	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 7	1.6075	0.00591	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L08	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time >= 8	1.2538	0.00403	<.0001
mpriordef_CD*mtimesinceD_CD	Z00	Z00	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	base level prior_default_cnt = 0; base level prior_default_cnt = 0			
vtimesinced_CD_pw1			Variate piecwise of cx_time[1]	median(0,cx_time-8,24-8)	-0.0586	0.000397	<.0001
vtimesinced_CD_pw2			Variate piecwise of cx_time[1]	median(0,cx_time-24,40-24)	-0.00787	0.000875	<.0001

Current Transition Model Parameters – FRM30SR C_CXS

The model parameters for the FRM30SR current to self-cure transition are shown below.

Table 34: Current to Self-Cure Transition FRM30SR Model Parameters

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept					-4.7021	0.0543	<.0001
mseason	1		Categorical of season	season = "winter"	0.2802	0.0055	<.0001
mseason	2		Categorical of season	season = "spring"	-0.1122	0.00589	<.0001
mseason	3		Categorical of season	season = "summer"	0.215	0.00548	<.0001
mseason	4		Categorical of season	base level: season = "fall"			
mcalperiod_CCXS	L199501		Categorical of Calendar Period	period < 199501	-3.6466	0.0543	<.0001
mcalperiod_CCXS	L200104		Categorical of Calendar Period	period < 200104	-2.8357	0.0207	<.0001
mcalperiod_CCXS	L200604		Categorical of Calendar Period	period < 200604	-1.9816	0.0144	<.0001
mcalperiod_CCXS	Z201800		Categorical of Calendar Period	base level: else			

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mltv	L00		Categorical of ltv_i_r[7] (loan-to-value)	ltv_i_r=.	0.2421	0.0127	<.0001
mltv	Z01		Categorical of ltv_i_r[7] (loan-to-value)	base level: else			
mperiodnbr_CCXS	L02		Categorical of period_number	period_number <= 2	-0.0644	0.013	<.0001
mperiodnbr_CCXS	L03		Categorical of period_number	period_number = 3	0.000672	0.0125	0.9571
mperiodnbr_CCXS	L04		Categorical of period_number	period_number = 4	0.0448	0.0119	0.0002
mperiodnbr_CCXS	L05		Categorical of period_number	period_number = 5	0.0538	0.0117	<.0001
mperiodnbr_CCXS	L06		Categorical of period_number	period_number = 6	0.0808	0.0113	<.0001
mperiodnbr_CCXS	L07		Categorical of period_number	period_number = 7	-0.0571	0.0119	<.0001
mperiodnbr_CCXS	Z00		Categorical of period_number	base level: else			
vperiodnbr_CCXS_pw1			Variate piecewise of period_number	median(0,period_number-8,30-8)	-0.0231	0.000427	<.0001
vperiodnbr_CCXS_pw2			Variate piecewise of period_number	median(0,period_number-30,54-30)	-0.00948	0.000523	<.0001
vperiodnbr_CCXS_pw3			Variate piecewise of period_number	median(0,period_number-54,70-54)	-0.0159	0.00123	<.0001
vperiodnbr_CCXS_pw4			Variate piecewise of period_number	median(0,period_number-70,100-70)	-0.0127	0.00133	<.0001
mcredit_score_CCXS	L00		Categorical of credit_score	credit_score=0	-0.3466	0.0182	<.0001
mcredit_score_CCXS	Z00		Categorical of credit_score	base level: else			
vcredit_CCXS_pw1			Variate piecewise of credit_score	median(0,credit_score-525,680-525)	-0.00211	0.000156	<.0001
vcredit_CCXS_pw2			Variate piecewise of credit_score	median(0,credit_score-680,745-680)	-0.00971	0.000441	<.0001
vcredit_CCXS_pw3			Variate piecewise of credit_score	median(0,credit_score-745,800-745)	-0.0114	0.00115	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L01	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time <= 1	2.4611	0.00849	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L01	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 2	2.1542	0.0107	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L01	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 3	1.8838	0.0135	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L01	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 4	1.7486	0.0156	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mpriordef_CCXS*mtimesinceD_CCXS	L01	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 5	1.4575	0.0196	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L01	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 6	1.301	0.0225	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L01	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 7	1.3	0.0244	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L01	L08	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 8	1.1757	0.0276	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L01	L09	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 9	1.0627	0.0315	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L01	L10	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 10	1.0084	0.0339	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L01	L11	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 11	1.0759	0.0356	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L01	L12	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 12	0.9916	0.0388	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L01	L13	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time >= 13	0.6963	0.0172	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L02	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time <= 1	2.9975	0.00968	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L02	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 2	2.7001	0.0127	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L02	L03	Interaction of categorical of prior_default_cnt	prior_default_cnt = 2; cx_time = 3	2.3735	0.017	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			and categorical of cx_time[1]				
mpriordef_CCXS*mtimesinceD_CCXS	L02	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 4	2.2381	0.0202	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L02	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 5	1.9049	0.0263	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L02	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 6	1.7687	0.0305	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L02	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 7	1.6494	0.0355	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L02	L08	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 8	1.5648	0.0399	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L02	L09	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 9	1.3606	0.0478	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L02	L10	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 10	1.3787	0.0504	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L02	L11	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 11	1.3485	0.0552	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L02	L12	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 12	1.2394	0.0616	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L02	L13	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time >= 13	0.9914	0.0263	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L03	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time <= 1	3.1766	0.00896	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L03	L02	Interaction of categorical of	prior_default_cnt >= 3; cx_time = 2	2.8109	0.0105	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			prior_default_cnt and categorical of cx_time[1]				
mpriordef_CCXS*mtimesinceD_CCXS	L03	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 3	2.484	0.0129	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L03	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 4	2.3185	0.0152	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L03	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 5	1.9453	0.0196	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L03	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 6	1.7853	0.0228	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L03	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 7	1.7043	0.026	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L03	L08	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 8	1.5388	0.0303	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L03	L09	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 9	1.3916	0.0354	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L03	L10	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 10	1.3693	0.0382	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L03	L11	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 11	1.235	0.044	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L03	L12	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 12	1.143	0.0491	<.0001
mpriordef_CCXS*mtimesinceD_CCXS	L03	L13	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time >= 13	0.8825	0.023	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mpriordef_CCXS*mtimesinceD_CCXS	Z00	Z00	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	base level prior_default_cnt = 0; base level prior_default_cnt = 0			
vpriordef_CCXS_pw1			Variate of prior_default_cnt	median(0,prior_default_cnt-2,10-2)	0.1254	0.00197	<.0001
vpriordef_CCXS_pw2			Variate of prior_default_cnt	median(0,prior_default_cnt-10,15-10)	0.1105	0.00635	<.0001
vhpa2yb_CCXS_pw1			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r[6]-85,130-85)	-0.00138	0.000252	<.0001
vratiotmptei_CCXS_pw1			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-5,30-5)	-0.00509	0.000321	<.0001
vratiotmptei_CCXS_pw2			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-30,55-30)	0.00462	0.000976	<.0001
vltv_CCXS_pw1			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-78,85-78)	0.00555	0.00115	<.0001
vltv_CCXS_pw2			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-85,88-85)	0.0116	0.00301	0.0001
vltv_CCXS_pw3			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-88,92-88)	-0.0337	0.00251	<.0001
vltv_CCXS_pw4			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-92,95-92)	0.1103	0.00327	<.0001
vloanraw_ccxs_pw1			Variate piecewise of loansize_raw	median(0,loansize_raw-0,57000-0)	-2.53E-06	8.64E-07	0.0034
vloanraw_ccxs_pw2			Variate piecewise of loansize_raw	median(0,loansize_raw-57000,159000-57000)	-2.36E-06	7.49E-08	<.0001
vloanraw_ccxs_pw3			Variate piecewise of loansize_raw	median(0,loansize_raw-159000,345000-159000)	-3.07E-07	4.71E-08	<.0001
vdeltaUEinit_CCXS_pw1			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-20,95-20)	0.00125	0.000159	<.0001
vSBOI_CCXS_pw1			Variate piecewise of small business optimism index	median(0,mSBOI-85,100-85)	-0.00521	0.000832	<.0001
vSBOI_CCXS_pw2			Variate piecewise of small business optimism index	median(0,mSBOI-100,108-100)	-0.0238	0.00124	<.0001

Current Transition Model Parameters – FRM30SR C_D

The model parameters for the FRM30SR current to default transition are shown below.

Table 35: Current to Default Transition FRM30SR Model Parameters

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept					-3.45	0.0395	<.0001
mseason	1		Categorical of season	season = "winter"	-0.2039	0.00264	<.0001
mseason	2		Categorical of season	season = "spring"	-0.3661	0.00267	<.0001
mseason	3		Categorical of season	season = "summer"	-0.1643	0.00256	<.0001
mseason	4		Categorical of season	base level: season = "fall"			
mjudicial	1		Categorical of judicial (judicial state)	judicial = 1 (yes)	0.0239	0.00204	<.0001
mjudicial	2		Categorical of judicial (judicial state)	base level: else			
mycslope_CD	L01		Categorical of Yield Curve Slope	1<=ycslope<=2	0.2161	0.00311	<.0001
mycslope_CD	Z00		Categorical of Yield Curve Slope	base level: else			
mcalperiod_CD	L199504		Categorical of Calendar Period	period < 199504	-2.0523	0.0119	<.0001
mcalperiod_CD	L200104		Categorical of Calendar Period	period < 200104	-1.2062	0.00653	<.0001
mcalperiod_CD	L200604		Categorical of Calendar Period	period < 200604	-0.4816	0.00453	<.0001
mcalperiod_CD	Z201800		Categorical of Calendar Period	base level: else			
mperiodnbr_CD	L02		Categorical of period_number	period_number = 2	-0.344	0.00592	<.0001
mperiodnbr_CD	L03		Categorical of period_number	period_number = 3	-0.0895	0.00533	<.0001
mperiodnbr_CD	Z00		Categorical of period_number	base level: else			
vperiodnbr_CD_pw1			Variate piecewise of period_number	median(0,period_number-3,45-3)	-0.0163	0.000132	<.0001
vperiodnbr_CD_pw2			Variate piecewise of period_number	median(0,period_number-45,70-45)	-0.00911	0.000332	<.0001
vperiodnbr_CD_pw3			Variate piecewise of period_number	median(0,period_number-70,108-70)	-0.0103	0.00067	<.0001
Mcredit_score_CD	L00		Categorical of credit_score	credit_score=0	-0.3147	0.0072	<.0001
Mcredit_score_CD	Z00		Categorical of credit_score	base level: else			
vcredit_CD_pw1			Variate piecewise of credit_score	median(0,credit_score-600,630-600)	-0.00283	0.000369	<.0001
vcredit_CD_pw2			Variate piecewise of credit_score	median(0,credit_score-630,680-630)	-0.0069	0.000246	<.0001
vcredit_CD_pw3			Variate piecewise of credit_score	median(0,credit_score-680,745-680)	-0.00848	0.000255	<.0001
vcredit_CD_pw4			Variate piecewise of credit_score	median(0,credit_score-745,800-745)	-0.0127	0.000612	<.0001
vratiotmptei_CD_pw1			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,24-0)	-0.00922	0.000161	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
vratiotmptei_CD_pw2			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-24,36-24)	0.02	0.000572	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time <= 1	2.5549	0.00414	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 2	2.2887	0.00509	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 3	2.0749	0.0061	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 4	1.7913	0.00755	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 5	1.5947	0.00896	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 6	1.4629	0.0102	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 7	1.3853	0.0114	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L08	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 8	1.2309	0.0133	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L09	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 9	1.1422	0.0149	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L10	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 10	1.0444	0.0165	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L11	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 11	1.03	0.0178	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mpriordef_CD*mtimesinceD_CD	L01	L12	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 12	0.992	0.0195	<.0001
mpriordef_CD*mtimesinceD_CD	L01	L13	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time >= 13	0.9391	0.0127	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time <= 1	3.0547	0.00498	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 2	2.7864	0.00635	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 3	2.596	0.00784	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 4	2.2774	0.0101	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 5	2.0712	0.0122	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 6	1.8743	0.0146	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 7	1.8225	0.0163	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L08	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 8	1.6554	0.0193	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L09	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 9	1.5489	0.0219	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L10	Interaction of categorical of prior_default_cnt	prior_default_cnt = 2; cx_time = 10	1.4579	0.0245	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			and categorical of cx_time[1]				
mpriordef_CD*mtimesinceD_CD	L02	L11	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 11	1.3738	0.0274	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L12	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 12	1.2643	0.031	<.0001
mpriordef_CD*mtimesinceD_CD	L02	L13	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time >= 13	1.215	0.0164	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time <= 1	3.2329	0.00464	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 2	2.9459	0.00538	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 3	2.7262	0.00634	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 4	2.38	0.00788	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 5	2.1628	0.00946	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 6	1.9521	0.0112	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 7	1.8451	0.0128	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L08	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 8	1.6383	0.0154	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L09	Interaction of categorical of	prior_default_cnt >= 3; cx_time = 9	1.5312	0.0175	<.0001

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			prior_default_cnt and categorical of cx_time[1]				
mpriordef_CD*mtimesinceD_CD	L03	L10	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 10	1.4114	0.0199	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L11	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 11	1.3454	0.022	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L12	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 12	1.2361	0.0251	<.0001
mpriordef_CD*mtimesinceD_CD	L03	L13	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time >= 13	1.095	0.015	<.0001
mpriordef_CD*mtimesinceD_CD	Z00	Z00	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	base level prior_default_cnt = 0; base level prior_default_cnt = 0			
vtimesinced_CD_pw1			Variate piecwise of cx_time[1]	median(0,cx_time-12,24-12)	-0.0322	0.00179	<.0001
vtimesinced_CD_pw2			Variate piecwise of cx_time[1]	median(0,cx_time-24,40-24)	-0.0203	0.00224	<.0001
vpriordef_CD_pw1			Variate of prior_default_cnt	median(0,prior_default_cnt-2,10-2)	0.1261	0.000999	<.0001
vsato_cd_pw1			Variate piecewise of sato (spread at origination)	median(-2,sato,0)	-0.0648	0.00508	<.0001
vsato_cd_pw2			Variate piecewise of sato (spread at origination)	median(sato,0,2)	0.2918	0.00354	<.0001
vdeltaUEinit_CD_pw1			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-100,200-100)	0.00308	0.000049	<.0001
vUEblend_CD_pw1			Variate piecewise of ue_blended_r[8] (unemployment rate)	median(0,ue_blended_r-400,1000-400)	0.000115	8.06E-06	<.0001
mltv	L00		Categorical of ltv_i_r[7] (loan-to-value)	ltv_i_r=.	0.2346	0.0273	<.0001
mltv	Z01		Categorical of ltv_i_r[7] (loan-to-value)	base level: else			

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
vltv_CD_pw1			Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-0,62-0)	0.0023	0.000464	<.0001
vltv_CD_pw2			Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-62,84-62)	0.000954	0.000239	<.0001
vltv_CD_pw3			Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-86,92-86)	0.0309	0.000623	<.0001
vltv_CD_pw4			Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-92,95-92)	0.0748	0.00162	<.0001
vltv_CD_pw5			Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-95,97-95)	0.0712	0.00328	<.0001
vltv_CD_pw6			Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-97,100-97)	0.0917	0.00536	<.0001
vhpa2yb_CD_pw1			Variate piecewise of hpa2y_blended_r^6	median(0,hpa2y_blended_r-0,85-0)	0.00137	0.000334	<.0001
vhpa2yb_CD_pw2			Variate piecewise of hpa2y_blended_r^6	median(0,hpa2y_blended_r-85,95-85)	-0.0195	0.000514	<.0001
vhpa2yb_CD_pw3			Variate piecewise of hpa2y_blended_r^6	median(0,hpa2y_blended_r-95,113-95)	-0.0182	0.000296	<.0001
vhpa2yb_CD_pw4			Variate piecewise of hpa2y_blended_r^6	median(0,hpa2y_blended_r-113,118-113)	-0.00307	0.000842	0.0003
vhpa2yb_CD_pw5			Variate piecewise of hpa2y_blended_r^6	median(0,hpa2y_blended_r-118,130-118)	-0.0118	0.000565	<.0001
vSBOI_CD_pw1			Variate piecewise of SBOI (small business optimism index)	median(0,mSBOI-85,100-85)	-0.00391	0.000632	<.0001
vSBOI_cd_pw2			Variate piecewise of SBOI (small business optimism index)	median(0,mSBOI-100,108-100)	-0.0417	0.000718	<.0001
vCCI_CD_pw1			Variate piecewise of CCI (consumer confidence index)	median(0,mCCI-50,100-50)	0.000593	0.000148	<.0001

Current Transition Model Parameters – FRM30SR C_END

The model parameters for the FRM30SR current to end (refinance or payoff) transition are shown below.

Table 36: Current to End Transition FRM30SR Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				-14.4717	0.1386	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mseason	1	Categorical of season	season = "winter"	-0.0957	0.00398	<.0001
mseason	2	Categorical of season	season = "spring"	-0.1094	0.00405	<.0001
mseason	3	Categorical of season	season = "summer"	-0.117	0.00398	<.0001
mseason	4	Categorical of season	base level: season = "fall"			
mcalperiod_CEND	L200104	Categorical of Calendar Period	period < 200104	0.2845	0.00773	<.0001
mcalperiod_CEND	L200604	Categorical of Calendar Period	period < 200604	0.4177	0.00645	<.0001
mcalperiod_CEND	Z201800	Categorical of Calendar Period	base level: else			
mycslope_CEND	L01	Categorical of ycslope_r[9] (yield curve slope)	ycslope>=9	-0.8421	0.00512	<.0001
mycslope_CEND	Z00	Categorical of ycslope_r[9] (yield curve slope)	base level: else			
mfrst_tm_by	1	Categorical of frst_tm_by (first-time buyer)	frst_tm_by = "Y"	0.2115	0.038	<.0001
mfrst_tm_by	2	Categorical of frst_tm_by (first-time buyer)	base level: else			
mjudicial	1	Categorical of judicial (judicial state)	judicial = 1 (yes)	-0.134	0.0032	<.0001
mjudicial	2	Categorical of judicial (judicial state)	base level: else			
mperiodnbr_cend	L02	Categorical of period_number	period_number <= 2	-0.0648	0.0082	<.0001
mperiodnbr_cend	L03	Categorical of period_number	period_number = 3	0.6182	0.00674	<.0001
mperiodnbr_cend	L04	Categorical of period_number	period_number = 4	0.802	0.00639	<.0001
mperiodnbr_cend	L05	Categorical of period_number	period_number = 5	0.677	0.0065	<.0001
mperiodnbr_cend	L06	Categorical of period_number	period_number = 6	0.4656	0.0068	<.0001
mperiodnbr_cend	L07	Categorical of period_number	period_number = 7	0.318	0.00713	<.0001
mperiodnbr_cend	Z08	Categorical of period_number	base level: else			
vperiodnbr_cend_pw1		Variate piecewise of period_number	median(0,period_number-8,19-8)	-0.0405	0.000691	<.0001
vperiodnbr_cend_pw2		Variate piecewise of period_number	median(0,period_number-19,31-19)	-0.0801	0.000818	<.0001
vperiodnbr_cend_pw3		Variate piecewise of period_number	median(0,period_number-31,40-31)	-0.0489	0.00165	<.0001
vperiodnbr_cend_pw4		Variate piecewise of period_number	median(0,period_number-40,49-40)	-0.0798	0.00234	<.0001
vperiodnbr_cend_pw5		Variate piecewise of period_number	median(0,period_number-49,108-49)	-0.0587	0.00151	<.0001
vrefiincent_cend_pw1		Variate piecewise of refi_incent2_r[13]	median(0,refi_incent2_r-0,100-0)	0.0399	0.000579	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		(refinance incentive)				
vrefiincent_cend_pw2		Variate piecewise of refi_incent2_r[13] (refinance incentive)	median(0,refi_incent2_r-100,120-100)	0.1111	0.000297	<.0001
vrefiincent_cend_pw3		Variate piecewise of refi_incent2_r[13] (refinance incentive)	median(0,refi_incent2_r-120,135-120)	0.0384	0.000402	<.0001
vrefiincent_cend_pw4		Variate piecewise of refi_incent2_r[13] (refinance incentive)	median(0,refi_incent2_r-135,155-135)	0.0419	0.000439	<.0001
vrefiincent_cend_pw5		Variate piecewise of refi_incent2_r[13] (refinance incentive)	median(0,refi_incent2_r-155,200-155)	0.0104	0.000518	<.0001
mcredit_score_CEND	L00	Categorical of credit_score	credit_score=0	0.2694	0.0733	0.0002
mcredit_score_CEND	Z00	Categorical of credit_score	base level: else			
vcredit_cend_pw1		Variate piecewise of credit_score	median(0,credit_score-450,500-450)	0.00289	0.00161	0.0732
vcredit_cend_pw2		Variate piecewise of credit_score	median(0,credit_score-500,630-500)	0.00181	0.000271	<.0001
vcredit_cend_pw3		Variate piecewise of credit_score	median(0,credit_score-630,680-630)	-0.00263	0.000354	<.0001
vcredit_cend_pw4		Variate piecewise of credit_score	median(0,credit_score-680,745-680)	-0.00188	0.00031	<.0001
vcredit_cend_pw5		Variate piecewise of credit_score	median(0,credit_score-745,800-745)	-0.00338	0.000566	<.0001
mtimesinceD_CEND	L00	Categorical of cx_time[1](time since default)	prior_default_cnt=0	-0.1088	0.0214	<.0001
mtimesinceD_CEND	L01	Categorical of cx_time[1](time since default)	cx_time <= 1	-1.1393	0.0257	<.0001
mtimesinceD_CEND	L02	Categorical of cx_time[1](time since default)	cx_time = 2	-0.9383	0.0264	<.0001
mtimesinceD_CEND	L03	Categorical of cx_time[1](time since default)	cx_time = 3	-0.6764	0.0265	<.0001
mtimesinceD_CEND	L04	Categorical of cx_time[1](time since default)	cx_time <= 16	-0.098	0.0218	<.0001
mtimesinceD_CEND	Z00	Categorical of cx_time[1](time since default)	base level: else			
vtimesinced_cend_pw1		Variate of cx_time[1](time since default)	median(0,cx_time-16,55-16)	-0.00434	0.00247	0.0793
vhpa2yb_cend_pw1		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-0,90-0)	-0.00989	0.000175	<.0001
vhpa2yb_cend_pw2		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-90,106-90)	0.0258	0.000473	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vhpa2yb_cend_pw3		Variate piecewise of hpa2y_blended_r^6	median(0,hpa2y_blended_r-106,111-106)	-0.0191	0.00131	<.0001
vhpa2yb_cend_pw4		Variate piecewise of hpa2y_blended_r^6	median(0,hpa2y_blended_r-111,114-111)	0.0318	0.00243	<.0001
vhpa2yb_cend_pw5		Variate piecewise of hpa2y_blended_r^6	median(0,hpa2y_blended_r-114,119-114)	0.0156	0.00155	<.0001
vhpa2yb_cend_pw6		Variate piecewise of hpa2y_blended_r^6	median(0,hpa2y_blended_r-119,130-119)	-0.0268	0.000751	<.0001
mRatioTmpTei_CEND	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	1.6526	0.0882	<.0001
mRatioTmpTei_CEND	Z01	Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_cend_pw1		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,12-0)	0.0769	0.00754	<.0001
vratiotmptei_cend_pw2		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-12,35-12)	0.0172	0.000593	<.0001
vdeltaUEinit_cend_pw1		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-65,78-65)	0.0131	0.000599	<.0001
vdeltaUEinit_cend_pw2		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-78,90-78)	-0.00904	0.000665	<.0001
vdeltaUEinit_cend_pw3		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-90,97-90)	0.0304	0.000919	<.0001
vdeltaUEinit_cend_pw4		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-97,126-97)	0.0184	0.000254	<.0001
vdeltaUEinit_cend_pw5		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-126,150-126)	-0.00206	0.000312	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vloanraw_cend_pw1		Variate piecewise of loansize_raw	median(0,loansize_raw-0,57000-0)	0.000045	8.32E-07	<.0001
vloanraw_cend_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-57000,159000-57000)	0.000015	6.03E-08	<.0001
vloanraw_cend_pw3		Variate piecewise of loansize_raw	median(0,loansize_raw-159000,345000-159000)	2.75E-06	3.35E-08	<.0001
vltv_cend_pw1		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-0,78-0)	-0.00391	0.000091	<.0001
vltv_cend_pw2		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-78,89-78)	0.015	0.000653	<.0001
vltv_cend_pw3		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-89,92-89)	0.039	0.00214	<.0001
vltv_cend_pw4		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-92,97-92)	0.0624	0.00149	<.0001
vltv_cend_pw5		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-97,100-97)	-0.0578	0.00608	<.0001
vSBOI_CEND_pw1		Variate piecewise of (SBOI) small business optimism index	median(0,mSBOI-85,100-85)	-0.00211	0.00071	0.0029
vSBOI_cend_pw2		Variate piecewise of (SBOI) small business optimism index	median(0,mSBOI-100,108-100)	0.00898	0.00109	<.0001

Current Transition Model Parameters – FRM15 C_SR

The model parameters for the FRM15 current to streamlined refinance transition are shown below.

Table 37: Current to Streamlined Refinance Transition FRM15 Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				-6.4988	0.0764	0.0000
mjudicial	1	Categorical of judicial (judicial state)	judicial = 1 (judicial state)	0.0195	0.0085	0.0217
mjudicial	2	Categorical of judicial (judicial state)	base level: else (non-judicial state)			
mfrst_tm_by	1	Categorical of frst_tm_by (first-time buyer)	frst_tm_by = "Y"	-0.4861	0.0189	0.0000
mfrst_tm_by	2	Categorical of frst_tm_by (first-time buyer)	base level: else			
mdpa_comb13_CSR	2	Categorical of dpa (down payment assistance)	dpa = "nonprof"	0.7892	0.0384	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mdpa_comb13_CSR	3	Categorical of dpa (down payment assistance)	dpa = "govt" or dpa = "relative"	-0.1565	0.0350	0.0000
mdpa_comb13_CSR	4	Categorical of dpa (down payment assistance)	base level: dpa = "na_other"			
mpriordef_CSR	L01	Categorical of prior default count	prior_default_cnt = 1	-0.0827	0.0191	0.0000
mpriordef_CSR	L02	Categorical of prior default count	prior_default_cnt = 2	-0.2076	0.0357	0.0000
mpriordef_CSR	L03	Categorical of prior default count	prior_default_cnt >= 3	-0.0781	0.0360	0.0302
mpriordef_CSR	Z00	Categorical of prior default count	base level: prior_default_cnt = 0			
mperiodnbr_CSR	L02	Categorical of period_number	period_number = 2	-0.8648	0.0377	0.0000
mperiodnbr_CSR	L03	Categorical of period_number	period_number = 3	0.1483	0.0288	0.0000
mperiodnbr_CSR	L04	Categorical of period_number	period_number = 4	0.6329	0.0260	0.0000
mperiodnbr_CSR	L05	Categorical of period_number	period_number = 5	0.5976	0.0251	0.0000
mperiodnbr_CSR	L06	Categorical of period_number	period_number = 6	0.5908	0.0249	0.0000
mperiodnbr_CSR	L07	Categorical of period_number	period_number = 7	0.5140	0.0247	0.0000
mperiodnbr_CSR	L08	Categorical of period_number	period_number = 8	0.4319	0.0247	0.0000
mperiodnbr_CSR	L09	Categorical of period_number	period_number = 9	0.4017	0.0248	0.0000
mperiodnbr_CSR	L10	Categorical of period_number	period_number = 10	0.3674	0.0252	0.0000
mperiodnbr_CSR	L11	Categorical of period_number	period_number = 11	0.2637	0.0259	0.0000
mperiodnbr_CSR	L12	Categorical of period_number	period_number = 12	0.1460	0.0267	0.0000
mperiodnbr_CSR	L13	Categorical of period_number	period_number = 13	0.0447	0.0277	0.1072
mperiodnbr_CSR	Z14	Categorical of period_number	base level: else			
vperiodnbr_CSR_pw1		Variate piecewise of period_number	median(0,period_number-13,24-13)	-0.0574	0.0026	0.0000
vperiodnbr_CSR_pw2		Variate piecewise of period_number	median(0,period_number-24,43-24)	-0.1040	0.0022	0.0000
mcredit_score_CSR	L00	Categorical of credit_score	credit_score = 0	-0.3294	0.0160	0.0000
mcredit_score_CSR	Z00	Categorical of credit_score	base level: else			
vcredit_CSR_pw2		Variate piecewise of credit_score	median(0,credit_score-650,770-650)	-0.0022	0.0001	0.0000
vcredit_CSR_pw3		Variate piecewise of credit_score	median(0,credit_score-770,800-770)	-0.0072	0.0009	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vdeltaUEinit_CSR_pw2		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-63,91-63)	0.0036	0.0008	0.0000
vdeltaUEinit_CSR_pw3		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-91,99-91)	-0.0291	0.0026	0.0000
vdeltaUEinit_CSR_pw4		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-99,104-99)	0.0874	0.0042	0.0000
vdeltaUEinit_CSR_pw5		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-104,200-104)	0.0010	0.0003	0.0008
vdeltaUEinit_CSR_pw6		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-200,300-200)	-0.0035	0.0009	0.0001
vratiotmptei_CSR_pw2		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-11,16-11)	0.0082	0.0030	0.0062
vratiotmptei_CSR_pw3		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-16,43-16)	0.0104	0.0007	0.0000
vratiotmptei_CSR_pw4		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-43,50-43)	-0.0641	0.0102	0.0000
vltv_CSR_pw1		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-0,39-0)	-0.0033	0.0008	0.0000
vltv_CSR_pw2		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-39,93-39)	0.0060	0.0004	0.0000
vltv_CSR_pw3		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-93,100-93)	0.0778	0.0106	0.0000
vloanraw_CSR_pw1		Variate piecewise of loansize_raw	median(0,loansize_raw-0,62400-0)	0.0000	0.0000	0.0000
vloanraw_CSR_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-62400,124000-62400)	0.0000	0.0000	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vloanraw_CSR_pw3		Variate piecewise of loansize_raw	median(0,loansize_raw-124000,250000-124000)	0.0000	0.0000	0.0000
vloanraw_CSR_pw4		Variate piecewise of loansize_raw	median(0,loansize_raw-250000,425000-250000)	0.0000	0.0000	0.0000
vhpa2yb_CSR_pw1		Variate piecewise of hpa2y_blended_r^6	median(0,hpa2y_blended_R-88,105-88)	-0.0156	0.0012	0.0000
vhpa2yb_CSR_pw3		Variate piecewise of hpa2y_blended_r^6	median(0,hpa2y_blended_R-112,117-112)	-0.0113	0.0034	0.0010
vhpa2yb_CSR_pw4		Variate piecewise of hpa2y_blended_r^6	median(0,hpa2y_blended_R-117,140-117)	-0.0066	0.0016	0.0000
vsato_csr_pw1		Variate piecewise of sato (spread at origination)	min(0,sato-.4)	0.9677	0.0121	0.0000
vsato_csr_pw2		Variate piecewise of sato (spread at origination)	max(sato-.4,0)	0.1904	0.0385	0.0000
vDeltaTY1_CSR_pw1		Variate piecewise of DeltaTy1Init_r^3 (change in 1-year Treasury rate from policy inception to current)	median(0,DeltaTy1Init_R-0,73-0)	-0.0143	0.0004	0.0000
vDeltaTY1_CSR_pw2		Variate piecewise of DeltaTy1Init_r^3 (change in 1-year Treasury rate from policy inception to current)	median(0,DeltaTy1Init_R-73,150-73)	0.0019	0.0002	0.0000
mdeltaTy10Init_csr	L01	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r >109	-0.9116	0.0138	0.0000
mdeltaTy10Init_csr	Z00	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	base level: else			
mseason_grp_CSR	L02	Categorical of season	season = "spring"	0.0524	0.0102	0.0000
mseason_grp_CSR	L03	Categorical of season	season = "summer"	-0.0713	0.0105	0.0000
mseason_grp_CSR	Z0104	Categorical of season	base level: else			
mycslope_CSR	L01	Categorical of ycslope_r^9 (yield curve slope)	ycslope_r<=218	-0.2590	0.0184	0.0000
mycslope_CSR	Z00	Categorical of ycslope_r^9 (yield curve slope)	base level: else			
vCCI_CSR_pw1		Variate piecewise of consumer confidence index	median(0,CCI_r-30,75-30)	0.0177	0.0011	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vCCI_CSR_pw2		Variate piecewise of consumer confidence index	median(0,CCI_r-75,110-75)	-0.0277	0.0009	0.0000
vCCI_CSR_pw3		Variate piecewise of consumer confidence index	median(0,CCI_r-110,134-110)	0.0395	0.0013	0.0000
vSBOI_CSR_pw1		Variate piecewise of small business optimism index	median(0,SBOI_r-83,95-83)	-0.0122	0.0037	0.0010
vSBOI_CSR_pw2		Variate piecewise of small business optimism index	median(0,SBOI_r-95,100-95)	0.1618	0.0045	0.0000

Current Transition Model Parameters – FRM15 C_D

The model parameters for the FRM15 current to default transition are shown below.

Table 38: Current to Default Transition FRM15 Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				-3.5529	0.0481	0.0000
mdpa	1	Categorical of dpa (down payment assistance)	dpa = "govt"	0.0968	0.0485	0.0458
mdpa	2	Categorical of dpa (down payment assistance)	dpa= "nonprof"	0.2722	0.0142	0.0000
mdpa	3	Categorical of dpa (down payment assistance)	dpa = "relative"	0.1256	0.0125	0.0000
mdpa	4	Categorical of dpa (down payment assistance)	base level:dpa = "na_other"			
mpriordef_CD	L01	Categorical of prior default count	prior_default_cnt = 1	2.1156	0.0064	0.0000
mpriordef_CD	L02	Categorical of prior default count	prior_default_cnt = 2	2.8158	0.0077	0.0000
mpriordef_CD	L03	Categorical of prior default count	prior_default_cnt >= 3	3.2278	0.0077	0.0000
mpriordef_CD	Z00	Categorical of prior default count	prior_default_cnt = 0			
vpriordef_CD_pw1		Variate piecewise of prior_default_cnt	median(0,prior_default_cnt-3,15-3)	0.1679	0.0020	0.0000
mperiodnbr_CD	L02	Categorical of period_number	period_number = 2	-0.5843	0.0174	0.0000
mperiodnbr_CD	L03	Categorical of period_number	period_number = 3	-0.3651	0.0157	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mperiodnbr_CD	L04	Categorical of period_number	period_number = 4	-0.2642	0.0149	0.0000
mperiodnbr_CD	Z05	Categorical of period_number	base level: else			
vperiodnbr_CD_pw1		Variate piecewise of period_number	median(0,period_number-4,24-4)	-0.0361	0.0006	0.0000
vperiodnbr_CD_pw2		Variate piecewise of period_number	median(0,period_number-24,50-24)	-0.0191	0.0005	0.0000
vperiodnbr_CD_pw3		Variate piecewise of period_number	median(0,period_number-50,57-50)	0.0415	0.0028	0.0000
mcredit_score_CD	L00	Categorical of credit_score	credit_score = 0	-0.3902	0.0127	0.0000
mcredit_score_CD	Z00	Categorical of credit_score	base level: else			
vcredit_CD_pw1		Variate piecewise of credit_score	median(0,credit_score-500,650-500)	-0.0029	0.0001	0.0000
vcredit_CD_pw2		Variate piecewise of credit_score	median(0,credit_score-650,800-650)	-0.0104	0.0001	0.0000
vloanraw_CD_pw1		Variate piecewise of loansize_raw	median(0,loansize_raw-0,62400-0)	0.0000	0.0000	0.0000
vloanraw_CD_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-62400,124000-62400)	0.0000	0.0000	0.0000
vloanraw_CD_pw3		Variate piecewise of loansize_raw	median(0,loansize_raw-124000,250000-124000)	0.0000	0.0000	0.0000
vdeltaUEinit_CD_pw1		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-0,63-0)	0.0081	0.0005	0.0000
vdeltaUEinit_CD_pw3		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-97,200-97)	0.0020	0.0001	0.0000
vdeltaUEinit_CD_pw4		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-200,300-200)	0.0011	0.0003	0.0000
vratiotmptei_CD_pw3		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-11,37-11)	0.0128	0.0003	0.0000
vratiotmptei_CD_pw4		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-37,55-37)	-0.0072	0.0017	0.0000
vsato_cd_pw1		Variate piecewise of sato (spread at origination)	min(0,sato-.4)	0.0980	0.0056	0.0000
vsato_cd_pw2		Variate piecewise of sato (spread at origination)	max(sato-.4,0)	0.0755	0.0161	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mltv_CD	Miss	Categorical of ltv_i_r[7] (loan-to-value)	ltv_i_r = .	0.4318	0.0223	0.0000
mltv_CD	z00	Categorical of ltv_i_r[7] (loan-to-value)	base level: else			
vltv_CD_pw1		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-0,39-0)	0.0099	0.0006	0.0000
vltv_CD_pw2		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-39,90-39)	0.0096	0.0002	0.0000
vltv_CD_pw3		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-90,100-90)	0.0508	0.0032	0.0000
vhpa2yb_CD_pw1		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_R-88,105-88)	-0.0113	0.0007	0.0000
vhpa2yb_CD_pw2		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_R-105,112-105)	-0.0234	0.0010	0.0000
vhpa2yb_CD_pw4		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_R-123,140-123)	-0.0309	0.0014	0.0000
mseason_grp_CD	L02	Categorical of season	season = "spring"	-0.2302	0.0056	0.0000
mseason_grp_CD	L03	Categorical of season	season = "summer"	-0.1242	0.0053	0.0000
mseason_grp_CD	Z0104	Categorical of season	base level: else			
vCCI_CD_pw1		Variate piecewise of consumer confidence index	median(0,CCI_r-30,75-30)	-0.0104	0.0006	0.0000
vCCI_CD_pw2		Variate piecewise of consumer confidence index	median(0,CCI_r-75,110-75)	0.0181	0.0003	0.0000
vCCI_CD_pw3		Variate piecewise of consumer confidence index	median(0,CCI_r-110,134-110)	0.0221	0.0007	0.0000
vSBOI_CD_pw1		Variate piecewise of small business optimism index	median(0,SBOI_r-83,95-83)	-0.0193	0.0022	0.0000
vSBOI_CD_pw2		Variate piecewise of small business optimism index	median(0,SBOI_r-95,100-95)	-0.0914	0.0023	0.0000
vSBOI_CD_pw3		Variate piecewise of small business optimism index	median(0,SBOI_r-100,108-100)	-0.0830	0.0023	0.0000

Current Transition Model Parameters – FRM15 C_CXS

The model parameters for the FRM15 current to self-cure transition are shown below.

Table 39: Current to Self-Cure Transition FRM15 Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				-4.4539	0.0863	0.0000
mrfnc_ind	1	Categorical of rfnc_ind (refinanced loan indicator)	refinanced, non-streamlined	-0.0700	0.0130	0.0000
mrfnc_ind	2	Categorical of rfnc_ind (refinanced loan indicator)	streamlined refinanced	-0.3191	0.0208	0.0000
mrfnc_ind	3	Categorical of rfnc_ind (refinanced loan indicator)	base level: else			
mperiodnbr_CCXS	L02	Categorical of period_number	period_number = 2	-0.3699	0.0341	0.0000
mperiodnbr_CCXS	L03	Categorical of period_number	period_number = 3	-0.2833	0.0328	0.0000
mperiodnbr_CCXS	Z04	Categorical of period_number	base level: else			
vperiodnbr_CCXS_pw1		Variate piecewise of period_number	median(0,period_number-3,16-3)	-0.0186	0.0018	0.0000
vperiodnbr_CCXS_pw2		Variate piecewise of period_number	median(0,period_number-16,30-16)	-0.0368	0.0014	0.0000
vperiodnbr_CCXS_pw3		Variate piecewise of period_number	median(0,period_number-30,41-30)	-0.0341	0.0023	0.0000
vperiodnbr_CCXS_pw4		Variate piecewise of period_number	median(0,period_number-41,60-41)	-0.0075	0.0031	0.0152
mcredit_score_CCXS	L00	Categorical of credit_score	credit_score = 0	0.1265	0.0159	0.0000
mcredit_score_CCXS	Z00	Categorical of credit_score	base level: else			
vcredit_CCXS_pw2		Variate piecewise of credit_score	median(0,credit_score-643,800-643)	-0.0084	0.0001	0.0000
vloanraw_CCXS_pw1		Variate piecewise of loansize_raw	median(0,loansize_raw-0,40000-0)	0.0000	0.0000	0.0000
vloanraw_CCXS_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-40000,150000-40000)	0.0000	0.0000	0.0000
vdeltaUEinit_CCXS_pw2		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-45,150-45)	0.0012	0.0002	0.0000
vdeltaUEinit_CCXS_pw3		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-150,200-150)	0.0016	0.0005	0.0041
vdeltaUEinit_CCXS_pw4		Variate piecewise of DeltaUEInit_r[4] (change in unemployment	median(0,DeltaUEInit_R-200,300-200)	0.0014	0.0006	0.0298

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		rate from policy inception to current)				
mratio_tmp_tei_CCXS	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei = 0	0.1304	0.0250	0.0000
mratio_tmp_tei_CCXS	Z01	Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_CCXS_pw2		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-9,16-9)	0.0124	0.0032	0.0001
vratiotmptei_CCXS_pw3		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-16,36-16)	0.0061	0.0008	0.0000
mpriordef_CCXS	L01	Categorical of prior default count	prior_default_cnt = 1	1.9162	0.0124	0.0000
mpriordef_CCXS	L02	Categorical of prior default count	prior_default_cnt = 2	2.6039	0.0149	0.0000
mpriordef_CCXS	L10	Categorical of prior default count	prior_default_cnt >= 10	2.9323	0.0478	0.0000
mpriordef_CCXS	PW1	Categorical of prior default count	else	2.7602	0.0177	0.0000
mpriordef_CCXS	Z00	Categorical of prior default count	base level: prior_default_cnt = 0			
vpriordef_CCXS_pw1		Variate piecewise of prior_default_cnt	median(0,prior_default_cnt-2,10-2)	0.2031	0.0047	0.0000
vltv_CCXS_pw1		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-0,40-0)	0.0066	0.0015	0.0000
vltv_CCXS_pw2		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-40,60-40)	0.0029	0.0010	0.0051
vltv_CCXS_pw3		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-60,88-60)	0.0088	0.0008	0.0000
vltv_CCXS_pw4		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-88,100-88)	0.0182	0.0049	0.0002
vhpa2yb_CCXS_pw2		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_R-100,106-100)	-0.0294	0.0027	0.0000
vhpa2yb_CCXS_pw3		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_R-106,115-106)	-0.0065	0.0016	0.0000
mperiod_CCXS	L01	Categorical version of period	period < 200604	-2.0118	0.0364	0.0000
mperiod_CCXS	Z01	Categorical version of period	base level: else			
mseason_grp_CCXS	L02	Categorical of season	season = "spring"	-0.1690	0.0109	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mseason_grp_CCXS	L03	Categorical of season	season = "summer"	0.0073	0.0102	0.4739
mseason_grp_CCXS	Z0104	Categorical of season	base level: else			
vCCI_CCXS_pw2		Variate piecewise of consumer confidence index	median(0,CCI_r-75,110-75)	0.0307	0.0008	0.0000
vCCI_CCXS_pw3		Variate piecewise of consumer confidence index	median(0,CCI_r-110,134-110)	-0.0130	0.0011	0.0000
vSBOI_CCXS_pw1		Variate piecewise of small business optimism index	median(0,SBOI_r-83,95-83)	-0.0551	0.0025	0.0000
vSBOI_CCXS_pw2		Variate piecewise of small business optimism index	median(0,SBOI_r-95,100-95)	-0.1208	0.0051	0.0000

Current Transition Model Parameters – FRM15 C_PRE

The model parameters for the FRM15 current to prepayment transition are shown below.

Table 40: Current to Prepayment Transition FRM15 Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				-4.8185	0.0472	0.0000
mdpa_comb13_CPRE	2	Categorical of dpa (down payment assistance)	dpa = "nonprof"	-0.1386	0.0317	0.0000
mdpa_comb13_CPRE	3	Categorical of dpa (down payment assistance)	dpa = "govt" or dpa = "relative"	0.1166	0.0126	0.0000
mdpa_comb13_CPRE	4	Categorical of dpa (down payment assistance)	base level: dpa = "na_other"			
mperiodnbr_CPRE	L02	Categorical of period_number	period_number = 2	-2.0207	0.0246	0.0000
mperiodnbr_CPRE	L03	Categorical of period_number	period_number = 3	-1.2493	0.0175	0.0000
mperiodnbr_CPRE	L04	Categorical of period_number	period_number = 4	-0.8830	0.0148	0.0000
mperiodnbr_CPRE	L05	Categorical of period_number	period_number = 5	-0.5963	0.0131	0.0000
mperiodnbr_CPRE	L06	Categorical of period_number	period_number = 6	-0.4185	0.0122	0.0000
mperiodnbr_CPRE	L07	Categorical of period_number	period_number = 7	-0.3200	0.0118	0.0000
mperiodnbr_CPRE	L08	Categorical of period_number	period_number = 8	-0.2184	0.0115	0.0000
mperiodnbr_CPRE	L09	Categorical of period_number	period_number = 9	-0.1350	0.0113	0.0000
mperiodnbr_CPRE	L10	Categorical of period_number	period_number = 10	-0.0939	0.0113	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mperiodnbr_CPRE	L11	Categorical of period_number	period_number = 11	-0.0732	0.0114	0.0000
mperiodnbr_CPRE	L12	Categorical of period_number	period_number = 12	-0.0556	0.0115	0.0000
mperiodnbr_CPRE	Z13	Categorical of period_number	base level: else			
vperiodnbr_CPRE_pw1		Variate piecewise of period_number	median(0,period_number-12,34-12)	0.0045	0.0004	0.0000
vperiodnbr_CPRE_pw2		Variate piecewise of period_number	median(0,period_number-34,42-34)	0.0058	0.0011	0.0000
vperiodnbr_CPRE_pw3		Variate piecewise of period_number	median(0,period_number-42,56-42)	0.0375	0.0010	0.0000
vperiodnbr_CPRE_pw4		Variate piecewise of period_number	median(0,period_number-56,60-56)	0.3461	0.0041	0.0000
mcredit_score_CPRE	L00	Categorical of credit_score	credit_score = 0	0.5577	0.0244	0.0000
mcredit_score_CPRE	Z00	Categorical of credit_score	base level: else			
vcredit_CPRE_pw1		Variate piecewise of credit_score	median(0,credit_score-500,650-500)	0.0030	0.0002	0.0000
vcredit_CPRE_pw2		Variate piecewise of credit_score	median(0,credit_score-650,800-650)	0.0008	0.0001	0.0000
vloanraw_CPRE_pw1		Variate piecewise of loansize_raw	median(0,loansize_raw-0,62400-0)	0.0000	0.0000	0.0000
vloanraw_CPRE_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-62400,124000-62400)	0.0000	0.0000	0.0000
vloanraw_CPRE_pw3		Variate piecewise of loansize_raw	median(0,loansize_raw-124000,250000-124000)	0.0000	0.0000	0.0000
vloanraw_CPRE_pw4		Variate piecewise of loansize_raw	median(0,loansize_raw-250000,425000-250000)	0.0000	0.0000	0.0000
vdeltaUEinit_CPRE_pw2		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-63,97-63)	0.0045	0.0002	0.0000
vdeltaUEinit_CPRE_pw3		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-97,200-97)	0.0023	0.0001	0.0000
mratio_tmp_tei_CPRE	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei = 0	-0.3043	0.0327	0.0000
mratio_tmp_tei_CPRE	Z01	Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_CPRE_pw1		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,11-0)	-0.0162	0.0033	0.0000
vratiotmptei_CPRE_pw2		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-11,16-11)	-0.0068	0.0019	0.0004

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vratiotmptei_CPRE_pw3		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-16,36-16)	-0.0063	0.0004	0.0000
vratiotmptei_CPRE_pw4		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-36,50-36)	-0.0056	0.0015	0.0002
mpriordef_CPRE	L01	Categorical of prior default count	prior_default_cnt = 1	-0.0879	0.0075	0.0000
mpriordef_CPRE	L02	Categorical of prior default count	prior_default_cnt = 2	-0.2084	0.0130	0.0000
mpriordef_CPRE	L03	Categorical of prior default count	prior_default_cnt >= 3	-0.2980	0.0110	0.0000
mpriordef_CPRE	Z00	Categorical of prior default count	prior_default_cnt = 0			
vsato_CPre_pw1		Variate piecewise of sato (spread at origination)	min(0,sato-.4)	0.1185	0.0043	0.0000
vsato_CPre_pw2		Variate piecewise of sato (spread at origination)	max(sato-.4,0)	-0.1604	0.0146	0.0000
mltv_CPRE	Miss	Categorical of ltv_i_r[7] (loan-to-value)	ltv_i_r = .	-0.1702	0.0137	0.0000
mltv_CPRE	z00	Categorical of ltv_i_r[7] (loan-to-value)	base level: else			
vltv_CPRE_pw1		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-0,39-0)	-0.0100	0.0004	0.0000
vltv_CPRE_pw3		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-90,100-90)	-0.0749	0.0044	0.0000
mhpa2yb_CPRE	L084	Categorical of hpa2y_blended_r[6]	0<hpa2y_blended_R <= 84	0.2586	0.0198	0.0000
mhpa2yb_CPRE	L088	Categorical of hpa2y_blended_r[6]	hpa2y_blended_R <= 88	0.0837	0.0215	0.0001
mhpa2yb_CPRE	Z000	Categorical of hpa2y_blended_r[6]	base level: else			
vhpa2yb_CPRE_pw1		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_R-88,105-88)	0.0454	0.0009	0.0000
vhpa2yb_CPRE_pw2		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_R-105,112-105)	0.0158	0.0011	0.0000
vhpa2yb_CPRE_pw3		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_R-112,117-112)	0.0231	0.0014	0.0000
vhpa2yb_CPRE_pw4		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_R-117,140-117)	0.0129	0.0005	0.0000
mseason_grp_CPRE	L02	Categorical of season	season = "spring"	0.1220	0.0043	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mseason_grp_CPRE	L03	Categorical of season	season = "summer"	0.1310	0.0043	0.0000
mseason_grp_CPRE	Z0104	Categorical of season	base level: else			
vCCI_CPRE_pw1		Variate piecewise of consumer confidence index	median(0,CCI_r-30,75-30)	0.0012	0.0006	0.0585
vCCI_CPRE_pw2		Variate piecewise of consumer confidence index	median(0,CCI_r-75,110-75)	-0.0154	0.0002	0.0000
vCCI_CPRE_pw3		Variate piecewise of consumer confidence index	median(0,CCI_r-110,134-110)	-0.0162	0.0005	0.0000
vSBOI_CPRE_pw1		Variate piecewise of small business optimism index	median(0,SBOI_r-83,95-83)	0.0192	0.0022	0.0000
vSBOI_CPRE_pw2		Variate piecewise of small business optimism index	median(0,SBOI_r-95,100-95)	0.1128	0.0016	0.0000
vSBOI_CPRE_pw3		Variate piecewise of small business optimism index	median(0,SBOI_r-100,108-100)	0.0089	0.0014	0.0000

Current Transition Model Parameters – ARM C_SR

The model parameters for the ARM current to streamlined refinance transition are shown below.

Table 41: Current to Streamlined Refinance Transition ARM Model Parameters

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept					-8.5313	0.2627	0.0000
mjudicial	1		Categorical of judicial (judicial state)	judicial = 1 , judicial state	-0.1588	0.0089	0.0000
mjudicial	2		Categorical of judicial (judicial state)	base level: else, non-judicial state			
mdpa_nprof	LNPro		Categorical of dpa (down payment assistance)	dpa= "nonprof"	0.5074	0.0166	0.0000
mdpa_nprof	Zothr		Categorical of dpa (down payment assistance)	base level: else			
mycslope_CSR	L01		Categorical of Yield Curve Slope	1<=ycslope<=2	0.1317	0.0120	0.0000
mycslope_CSR	Z00		Categorical of Yield Curve Slope	base level: else			
mfrst_tm_by	1		Categorical of frst_tm_by (first-time buyer)	frst_tm_by = "Y"	-0.0329	0.0120	0.0062
mfrst_tm_by	2		Categorical of frst_tm_by (first-time buyer)	base level: else			

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mrfnc_ind	2		Categorical of rfnc_ind (refinanced loan indicator)	frnc_ind = "Y"	0.1880	0.0151	0.0000
mrfnc_ind	3		Categorical of rfnc_ind (refinanced loan indicator)	base level: else			
mperiodnbr_CSR	L02		Categorical of period_number	period_number = 2	-1.1684	0.0272	0.0000
mperiodnbr_CSR	L03		Categorical of period_number	period_number = 3	-0.1424	0.0193	0.0000
mperiodnbr_CSR	L04		Categorical of period_number	period_number = 4	0.2829	0.0168	0.0000
mperiodnbr_CSR	L05		Categorical of period_number	period_number = 5	0.3762	0.0165	0.0000
mperiodnbr_CSR	L06		Categorical of period_number	period_number = 6	0.1531	0.0179	0.0000
mperiodnbr_CSR	L07		Categorical of period_number	period_number = 7	-0.1423	0.0202	0.0000
mperiodnbr_CSR	Z08		Categorical of period_number	base level: else			
vperiodnbr_CSR_pw1			Variate piecewise of period_number	median(0,period_number-8,40-8)	-0.0637	0.0010	0.0000
vperiodnbr_CSR_pw2			Variate piecewise of period_number	median(0,period_number-40,53-40)	-0.0443	0.0045	0.0000
vperiodnbr_CSR_pw4			Variate piecewise of period_number	median(0,period_number-68,108-68)	-0.0231	0.0050	0.0000
mperiodnbr_CSR*mdpa_nprof	L02	LNPro	Interaction of Categorical of period_number and Categorical of dpa	period_number = 2; dpa= "nonprof"	-0.3126	0.0722	0.0000
mperiodnbr_CSR*mdpa_nprof	L03	LNPro	Interaction of Categorical of period_number and Categorical of dpa	period_number = 3; dpa= "nonprof"	-0.5143	0.0497	0.0000
mperiodnbr_CSR*mdpa_nprof	L04	LNPro	Interaction of Categorical of period_number and Categorical of dpa	period_number = 4; dpa= "nonprof"	-0.7190	0.0461	0.0000
mperiodnbr_CSR*mdpa_nprof	L05	LNPro	Interaction of Categorical of period_number and Categorical of dpa	period_number = 5; dpa= "nonprof"	-0.4156	0.0417	0.0000
mperiodnbr_CSR*mdpa_nprof	L06	LNPro	Interaction of Categorical of period_number and Categorical of dpa	period_number = 6; dpa= "nonprof"	-0.2901	0.0460	0.0000
mperiodnbr_CSR*mdpa_nprof	L07	LNPro	Interaction of Categorical of period_number	period_number = 7; dpa= "nonprof"	-0.2496	0.0531	0.0000

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			and Categorical of dpa				
mperiodnbr_CSR*mdpa_nprof	Z08	Zothr	Interaction of Categorical of period_number and Categorical of dpa	base level: else; base level: else			
vcredit_CSR_pw1			Variate piecewise of credit_score	0<credit_score<=450	-0.7246	0.2520	0.0040
vcredit_CSR_pw3			Variate piecewise of credit_score	median(0,credit_score-500,600-500)	-0.0012	0.0001	0.0000
vcredit_CSR_pw6			Variate piecewise of credit_score	median(0,credit_score-680,720-680)	-0.0051	0.0004	0.0000
vcredit_CSR_pw8			Variate piecewise of credit_score	median(0,credit_score-745,800-745)	-0.0059	0.0007	0.0000
vperiodnbr_CSR_pw1*mpriordef_ind	L01		Interaction of variate of piecewise of period_number and categorical of prior_default_cnt	median(0,period_number-8,40-8); prior_default_cnt ne 0	0.0119	0.0018	0.0000
vperiodnbr_CSR_pw2*mpriordef_ind	L01		Interaction of variate of piecewise of period_number and categorical of prior_default_cnt	median(0,period_number-40,53-40); prior_default_cnt ne 0	0.0552	0.0068	0.0000
vperiodnbr_CSR_pw3*mpriordef_ind	L01		Interaction of variate of piecewise of period_number and categorical of prior_default_cnt	median(0,period_number-53,68-53); prior_default_cnt ne 0	-0.0158	0.0067	0.0178
vperiodnbr_CSR_pw*mpriordef_ind	Z00		Interaction of variate of piecewise of period_number and categorical of prior_default_cnt	base level: else; base level: else			
vdeltaUEinit_CSR_pw1			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-0,90-0)	-0.0095	0.0006	0.0000
vdeltaUEinit_CSR_pw2			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-90,97-90)	0.0054	0.0028	0.0568
vdeltaUEinit_CSR_pw3			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy	median(0,deltaUEinit_r-97,100-97)	0.0593	0.0060	0.0000

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			inception to current)				
vdeltaUEinit_CSR_pw5			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-110,140-110)	0.0069	0.0006	0.0000
vdeltaUEinit_CSR_pw7			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-175,200-175)	-0.0046	0.0011	0.0000
vdeltaUEinit_CSR_pw8			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-200,300-200)	0.0041	0.0006	0.0000
mRatioTmpTei_CSR	L00		Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	0.6859	0.0333	0.0000
mRatioTmpTei_CSR	Z01		Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_CSR_pw1			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,24-0)	0.0195	0.0015	0.0000
vratiotmptei_CSR_pw2			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-24,36-24)	0.0031	0.0013	0.0191
vratiotmptei_CSR_pw3			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-36,50-36)	0.0061	0.0021	0.0032
mpriordef_CSR*mtimesinceD_CSR	L01	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time <= 1	-0.5962	0.0429	0.0000
mpriordef_CSR*mtimesinceD_CSR	L01	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 2	-0.5922	0.0511	0.0000
mpriordef_CSR*mtimesinceD_CSR	L01	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 3	-0.3976	0.0544	0.0000
mpriordef_CSR*mtimesinceD_CSR	L01	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; else	-0.0689	0.0309	0.0257

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mpriordef_CSR*mtimesinceD_CSR	L02	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time <= 1	-0.9202	0.0761	0.0000
mpriordef_CSR*mtimesinceD_CSR	L02	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 2	-0.7753	0.0876	0.0000
mpriordef_CSR*mtimesinceD_CSR	L02	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 3	-0.4724	0.0900	0.0000
mpriordef_CSR*mtimesinceD_CSR	L02	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; else	-0.0338	0.0445	0.4474
mpriordef_CSR*mtimesinceD_CSR	L03	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time <= 1	-1.1451	0.0803	0.0000
mpriordef_CSR*mtimesinceD_CSR	L03	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 2	-1.1939	0.1009	0.0000
mpriordef_CSR*mtimesinceD_CSR	L03	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 3	-0.6566	0.0950	0.0000
mpriordef_CSR*mtimesinceD_CSR	L03	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; else	-0.0263	0.0504	0.6017
mpriordef_CSR*mtimesinceD_CSR	Z00	Z00	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	base level prior_default_cnt = 0; base level prior_default_cnt = 0			
vpriordef_CSR_pw1			Variate piecewise of prior_default_cnt	median(0,prior_default_cnt-3,15-3)	0.0566	0.0131	0.0000
vsato_csr_pw1			Variate piecewise of sato (spread at origination)	min(0,sato-(-.1))	0.3751	0.0078	0.0000
vsato_csr_pw2			Variate piecewise of sato (spread at origination)	median(sato-(-.1),0,.7-(-.1))	0.7905	0.0511	0.0000
vsato_csr_pw3			Variate piecewise of sato (spread at origination)	max(sato-.7,0)	0.2090	0.1100	0.0573

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
vloanraw_CSR_pw1			Variate piecewise of loansize_raw	median(0,loansize_raw-0,64000-0)	0.0000	0.0000	0.0000
vloanraw_CSR_pw2			Variate piecewise of loansize_raw	median(0,loansize_raw-64000,157000-64000)	0.0000	0.0000	0.0000
vloanraw_CSR_pw3			Variate piecewise of loansize_raw	median(0,loansize_raw-157000,425000-157000)	0.0000	0.0000	0.0000
vltv_CSR_pw1			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-0,70-0)	0.0084	0.0012	0.0000
vltv_CSR_pw2			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-70,80-70)	0.0156	0.0029	0.0000
vltv_CSR_pw3			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-80,94-80)	0.0072	0.0013	0.0000
vltv_CSR_pw4			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-94,100-94)	0.0173	0.0051	0.0007
vhpa2yb_CSR_pw1			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-0,85-0)	0.0093	0.0019	0.0000
vhpa2yb_CSR_pw2			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-85,95-85)	-0.0116	0.0024	0.0000
vhpa2yb_CSR_pw3			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-95,113-95)	0.0048	0.0011	0.0000
vhpa2yb_CSR_pw5			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-120,136-120)	-0.0135	0.0013	0.0000
vhpa2yb_CSR_pw6			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-136,170-136)	-0.0230	0.0025	0.0000
vUEblend_CSR_pw1			Variate piecewise of ue_blended_r[8] (change in unemployment rate)	median(0,ue_blended_r-0,420-0)	0.0012	0.0002	0.0000
vUEblend_CSR_pw2			Variate piecewise of ue_blended_r[8] (change in unemployment rate)	median(0,ue_blended_r-420,820-420)	-0.0013	0.0000	0.0000
mcalperiod_CSR	L200104		Categorical of Calendar Period	period < 200604	0.1228	0.0247	0.0000
mcalperiod_CSR	L200604		Categorical of Calendar Period	period = 200604	0.4152	0.0356	0.0000
mcalperiod_CSR	L200701		Categorical of Calendar Period	period = 200701	0.6254	0.0353	0.0000
mcalperiod_CSR	L200702		Categorical of Calendar Period	period = 200702	0.9589	0.0331	0.0000
mcalperiod_CSR	L200703		Categorical of Calendar Period	period = 200703	0.8774	0.0353	0.0000
mcalperiod_CSR	Z201800		Categorical of Calendar Period	base level: else			
vdeltaUEpr3_csr_pw1			Variate piecewise of deltaueper3_r[5]	median(deltaueper3_r-(-200),0,(-20)-(-200))	0.0028	0.0003	0.0000

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			(change in unemployment from 3 quarters prior)				
vdeltaUEpr3_csr_pw2			Variate piecewise of deltauepr3_r[5] (change in unemployment from 3 quarters prior)	median(deltauepr3_r-(-20),0,10-(-20))	0.0081	0.0005	0.0000
vdeltaUEpr3_csr_pw3			Variate piecewise of deltauepr3_r[5] (change in unemployment from 3 quarters prior)	median(deltauepr3_r-10,0,200-10)	0.0048	0.0001	0.0000
mseason_grp_CSR	L02		Categorical of season	season = "spring"	-0.0379	0.0098	0.0001
mseason_grp_CSR	L03		Categorical of season	season = "summer"	-0.1347	0.0101	0.0000
mseason_grp_CSR	Z0104		Categorical of season	base level: else			
vCCI_CSR_pw1			Variate piecewise of consumer confidence index	median(0,CCI_r-30,75-30)	0.0097	0.0012	0.0000
vCCI_CSR_pw2			Variate piecewise of consumer confidence index	median(0,CCI_r-75,110-75)	-0.0155	0.0006	0.0000
vCCI_CSR_pw3			Variate piecewise of consumer confidence index	median(0,CCI_r-110,134-110)	0.0310	0.0018	0.0000
vSBOI_CSR_pw1			Variate piecewise of small business optimism index	median(0,SBOI_r-83,95-83)	-0.0189	0.0045	0.0000
vSBOI_CSR_pw2			Variate piecewise of small business optimism index	median(0,SBOI_r-95,100-95)	0.0430	0.0052	0.0000
vSBOI_CSR_pw3			Variate piecewise of small business optimism index	median(0,SBOI_r-100,108-100)	-0.1550	0.0035	0.0000

Current Transition Model Parameters – ARM C_CXS

The model parameters for the ARM current to self-cure transition are shown below.

Table 42: Current to Self-Cure Transition ARM Model Parameters

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept					-3.8635	0.1371	0.0000
mrfnc_ind	2		Categorical of rfnc_ind (refinanced loan indicator)	frnc_ind = "Y"	-0.1085	0.0137	0.0000

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mrfnc_ind	3		Categorical of rfnc_ind (refinanced loan indicator)	base level: else			
mdpa_rel	LRela		Categorical of dpa (down payment assistance)	dpa = "relative"	0.0634	0.0139	0.0000
mdpa_rel	Zothr		Categorical of dpa (down payment assistance)	base level: else			
mcalperiod_CCXS	L200104		Categorical of Calendar Period	period < 200604	-1.2431	0.0279	0.0000
mcalperiod_CCXS	L200604		Categorical of Calendar Period	period = 200604	1.0360	0.0318	0.0000
mcalperiod_CCXS	L200701		Categorical of Calendar Period	period = 200701	1.0535	0.0298	0.0000
mcalperiod_CCXS	L200702		Categorical of Calendar Period	period = 200702	0.3775	0.0356	0.0000
mcalperiod_CCXS	L200703		Categorical of Calendar Period	period = 200703	0.3095	0.0338	0.0000
mcalperiod_CCXS	Z201800		Categorical of Calendar Period	base level: else			
vpriordef_CCXS_pw1			Variate piecewise of prior_default_cnt	median(0,prior_default_cnt-3,15-3)	0.1159	0.0025	0.0000
mperiodnbr_CCXS	L02		Categorical of period_number	period_number = 2	-0.2307	0.0438	0.0000
mperiodnbr_CCXS	L03		Categorical of period_number	period_number = 3	0.0599	0.0382	0.1172
mperiodnbr_CCXS	L04		Categorical of period_number	period_number = 4	0.1643	0.0361	0.0000
mperiodnbr_CCXS	L05		Categorical of period_number	period_number = 5	0.1010	0.0364	0.0056
mperiodnbr_CCXS	L06		Categorical of period_number	period_number = 6	0.2024	0.0341	0.0000
mperiodnbr_CCXS	L07		Categorical of period_number	period_number = 7	0.1121	0.0343	0.0011
mperiodnbr_CCXS	Z08		Categorical of period_number	base level: else			
vperiodnbr_CCXS_pw1			Variate piecewise of period_number	median(0,period_number-8,36-8)	-0.0139	0.0008	0.0000
vperiodnbr_CCXS_pw2			Variate piecewise of period_number	median(0,period_number-36,53-36)	-0.0108	0.0012	0.0000
vperiodnbr_CCXS_pw3			Variate piecewise of period_number	median(0,period_number-53,76-53)	-0.0110	0.0011	0.0000
vperiodnbr_CCXS_pw4			Variate piecewise of period_number	median(0,period_number-76,108-76)	-0.0085	0.0016	0.0000
vcredit_CCXS_pw5			Variate piecewise of credit_score	median(0,credit_score-630,680-630)	-0.0034	0.0005	0.0000
vcredit_CCXS_pw6			Variate piecewise of credit_score	median(0,credit_score-680,720-680)	-0.0091	0.0011	0.0000
vcredit_CCXS_pw7			Variate piecewise of credit_score	median(0,credit_score-720,745-720)	-0.0062	0.0024	0.0102
vcredit_CCXS_pw8			Variate piecewise of credit_score	median(0,credit_score-745,800-745)	-0.0076	0.0017	0.0000
vdeltaUEinit_CCXS_pw1			Variate piecewise of DeltaUEInit_r[4]	median(0,deltaUEinit_r-0,62-0)	-0.0040	0.0013	0.0027

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			(change in unemployment rate from policy inception to current)				
vdeltaUEinit_CCXS_pw2			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-62,80-62)	0.0029	0.0010	0.0034
vdeltaUEinit_CCXS_pw6			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-126,200-126)	-0.0015	0.0003	0.0000
vdeltaUEinit_CCXS_pw7			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-200,300-200)	0.0006	0.0004	0.0858
mRatioTmpTei_CCXS	L00		Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	0.2880	0.0441	0.0000
mRatioTmpTei_CCXS	Z01		Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_CCXS_pw1			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,19-0)	0.0162	0.0023	0.0000
vratiotmptei_CCXS_pw4			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-33,50-33)	0.0054	0.0016	0.0007
mpriordef_CCXS*mtimesinceD_CCXS	L01	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time <= 1	2.4771	0.0205	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L01	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 2	2.2226	0.0259	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L01	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 3	1.9216	0.0328	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L01	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 4	1.8957	0.0365	0.0000

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mpriordef_CCXS*mtimesinceD_CCXS	L01	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 5	1.4662	0.0484	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L01	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 6	1.3759	0.0533	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L01	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 7	1.2653	0.0594	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L01	L08	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 8	1.1741	0.0659	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L01	L09	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 9	1.0841	0.0733	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L01	L10	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; else	1.0626	0.0358	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L02	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time <= 1	2.9266	0.0222	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L02	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 2	2.5963	0.0294	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L02	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 3	2.2955	0.0382	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L02	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 4	2.1649	0.0452	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L02	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 5	1.8578	0.0573	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L02	L06	Interaction of categorical of prior_default_cnt	prior_default_cnt = 2; cx_time = 6	1.6258	0.0683	0.0000

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			and categorical of cx_time[1]				
mpriordef_CCXS*mtimesinceD_CCXS	L02	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 7	1.6710	0.0717	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L02	L08	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 8	1.4967	0.0831	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L02	L09	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 9	1.5256	0.0867	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L02	L10	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; else	1.2762	0.0428	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L03	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time <= 1	3.2530	0.0166	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L03	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 2	2.8586	0.0196	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L03	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 3	2.4989	0.0242	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L03	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 4	2.2953	0.0288	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L03	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 5	1.9378	0.0366	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L03	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 6	1.7329	0.0431	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L03	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 7	1.6324	0.0489	0.0000

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mpriordef_CCXS*mtimesinceD_CCXS	L03	L08	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 8	1.6005	0.0535	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L03	L09	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 9	1.4285	0.0621	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	L03	L10	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; else	1.1705	0.0361	0.0000
mpriordef_CCXS*mtimesinceD_CCXS	Z00	Z00	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	base level prior_default_cnt = 0; base level prior_default_cnt = 0			
vtimesinced_CCXS_pw1			Variate piecwise of cx_time[1]	median(0,cx_time-10,24-10)	-0.0375	0.0039	0.0000
vtimesinced_CCXS_pw2			Variate piecwise of cx_time[1]	median(0,cx_time-24,40-24)	-0.0263	0.0054	0.0000
vloanraw_CCXS_pw1			Variate piecewise of loansize_raw	median(0,loansize_raw-0,64000-0)	0.0000	0.0000	0.0000
vloanraw_CCXS_pw2			Variate piecewise of loansize_raw	median(0,loansize_raw-64000,157000-64000)	0.0000	0.0000	0.0000
vhpa2yb_CCXS_pw1			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-0,100-0)	-0.0037	0.0010	0.0002
vhpa2yb_CCXS_pw2			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-100,104-100)	-0.0432	0.0043	0.0000
vhpa2yb_CCXS_pw4			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-113,115-113)	-0.0239	0.0059	0.0000
mseason_grp_CCXS	L02		Categorical of season	season = "spring"	-0.2965	0.0118	0.0000
mseason_grp_CCXS	L03		Categorical of season	season = "summer"	-0.0968	0.0111	0.0000
mseason_grp_CCXS	Z0104		Categorical of season	base level: else			
vCCI_CCXS_pw1			Variate piecewise of consumer confidence index	median(0,CCI_r-30,75-30)	0.0089	0.0012	0.0000
vCCI_CCXS_pw2			Variate piecewise of consumer confidence index	median(0,CCI_r-75,110-75)	0.0185	0.0008	0.0000
vCCI_CCXS_pw3			Variate piecewise of consumer confidence index	median(0,CCI_r-110,134-110)	-0.0069	0.0017	0.0000
vSBOI_CCXS_pw1			Variate piecewise of small business optimism index	median(0,SBOI_r-83,95-83)	-0.0617	0.0044	0.0000
vSBOI_CCXS_pw2			Variate piecewise of small business optimism index	median(0,SBOI_r-95,100-95)	-0.1054	0.0060	0.0000

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
vSBOI_CCXS_pw3			Variate piecewise of small business optimism index	median(0,SBOI_r-100,108-100)	0.0168	0.0050	0.0008

Current Transition Model Parameters – ARM C_D

The model parameters for the ARM current to default transition are shown below.

Table 43: Current to Default Transition ARM Model Parameters

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept					-3.4058	0.0695	0.0000
mjudicial	1		Categorical of judicial (judicial state)	judicial = 1 , judicial state	0.0410	0.0043	0.0000
mjudicial	2		Categorical of judicial (judicial state)	base level: else, non-judicial state			
mdpa_govt	LGovt		Categorical of dpa (down payment assistance)	dpa = "govt"	0.1224	0.0229	0.0000
mdpa_govt	Zothr		Categorical of dpa (down payment assistance)	base level: else			
mdpa_nprof	LNPro		Categorical of dpa (down payment assistance)	dpa= "nonprof"	0.2266	0.0108	0.0000
mdpa_nprof	Zothr		Categorical of dpa (down payment assistance)	base level: else			
mdpa_rel	LRela		Categorical of dpa (down payment assistance)	dpa = "relative"	0.0643	0.0068	0.0000
mdpa_rel	Zothr		Categorical of dpa (down payment assistance)	base level: else			
mycslope_cd	L01		Categorical of Yield Curve Slope	1<=ycslope<=2	0.2748	0.0065	0.0000
mycslope_cd	Z00		Categorical of Yield Curve Slope	base level: else			
mfrst_tm_by	1		Categorical of frst_tm_by (first-time buyer)	frst_tm_by = "Y"	0.0394	0.0059	0.0000
mfrst_tm_by	2		Categorical of frst_tm_by (first-time buyer)	base level: else			
mrfnc_ind	2		Categorical of rfnc_ind (refinanced loan indicator)	frnc_ind = "Y"	0.0539	0.0085	0.0000
mrfnc_ind	3		Categorical of rfnc_ind	base level: else			

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			(refinanced loan indicator)				
mcalperiod_cd	L200104		Categorical of Calendar Period	period < 200604	-0.3404	0.0096	0.0000
mcalperiod_cd	L200604		Categorical of Calendar Period	period = 200604	1.5724	0.0141	0.0000
mcalperiod_cd	L200701		Categorical of Calendar Period	period = 200701	1.0794	0.0166	0.0000
mcalperiod_cd	L200702		Categorical of Calendar Period	period = 200702	0.9084	0.0173	0.0000
mcalperiod_cd	L200703		Categorical of Calendar Period	period = 200703	0.4739	0.0168	0.0000
mcalperiod_cd	Z201800		Categorical of Calendar Period	base level: else			
mperiodnbr_CD	L02		Categorical of period_number	period_number = 2	-0.6841	0.0186	0.0000
mperiodnbr_CD	L03		Categorical of period_number	period_number = 3	-0.2481	0.0155	0.0000
mperiodnbr_CD	L04		Categorical of period_number	period_number = 4	-0.0948	0.0146	0.0000
mperiodnbr_CD	L05		Categorical of period_number	period_number = 5	-0.0262	0.0141	0.0642
mperiodnbr_CD	L06		Categorical of period_number	period_number = 6	0.0236	0.0138	0.0869
mperiodnbr_CD	L07		Categorical of period_number	period_number = 7	-0.0083	0.0138	0.5474
mperiodnbr_CD	Z08		Categorical of period_number	base level: else			
vperiodnbr_cd_pw1			Variate piecewise of period_number	median(0,period_number-8,40-8)	-0.0196	0.0005	0.0000
vperiodnbr_cd_pw2			Variate piecewise of period_number	median(0,period_number-40,53-40)	-0.0231	0.0020	0.0000
vperiodnbr_cd_pw3			Variate piecewise of period_number	median(0,period_number-53,68-53)	-0.0181	0.0023	0.0000
vperiodnbr_cd_pw1*mdpa_nprof	LNPro		Interaction of variate piecewise of period_number and categorical of dpa	median(0,period_number-8,40-8); dpa= "nonprof"	-0.0089	0.0007	0.0000
vperiodnbr_cd_pw2*mdpa_nprof	LNPro		Interaction of variate piecewise of period_number and categorical of dpa	median(0,period_number-40,53-40); dpa= "nonprof"	0.0103	0.0022	0.0000
vperiodnbr_cd_pw*mdpa_nprof	Zothr		Interaction of variate piecewise of period_number and categorical of dpa	mdpa_nprof base level: else;			
vcredit_cd_pw1			Variate piecewise of credit_score	0<credit_score<=450	-0.6980	0.1537	0.0000
vcredit_cd_pw3			Variate piecewise of credit_score	median(0,credit_score-500,600-500)	-0.0056	0.0004	0.0000
vcredit_cd_pw4			Variate piecewise of credit_score	median(0,credit_score-600,630-600)	-0.0056	0.0008	0.0000
vcredit_cd_pw5			Variate piecewise of credit_score	median(0,credit_score-630,680-630)	-0.0112	0.0005	0.0000

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
vcredit_cd_pw6			Variate piecewise of credit_score	median(0,credit_score-680,720-680)	-0.0122	0.0008	0.0000
vcredit_cd_pw7			Variate piecewise of credit_score	median(0,credit_score-720,745-720)	-0.0100	0.0017	0.0000
vcredit_cd_pw8			Variate piecewise of credit_score	median(0,credit_score-745,800-745)	-0.0110	0.0012	0.0000
icredit_grp0_CD	L000		Categorical of credit_score	credit_score=0	-0.9540	0.0332	0.0000
icredit_grp0_CD	Z999		Categorical of credit_score	base level: else			
vdeltaUEinit_cd_pw1			Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-0,90-0)	0.0027	0.0002	0.0000
vdeltaUEinit_cd_pw4			Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-100,110-100)	0.0029	0.0009	0.0010
vdeltaUEinit_cd_pw5			Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-110,140-110)	0.0015	0.0003	0.0000
vdeltaUEinit_cd_pw7			Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-175,200-175)	-0.0011	0.0004	0.0122
vdeltaUEinit_cd_pw8			Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-200,300-200)	0.0009	0.0002	0.0000
mRatioTmpTei_CD	L00		Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	0.3711	0.0162	0.0000
mRatioTmpTei_CD	Z01		Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_cd_pw1			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,24-0)	0.0161	0.0007	0.0000
vratiotmptei_cd_pw2			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-24,36-24)	0.0063	0.0007	0.0000

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
vratiotmptei_cd_pw3			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-36,50-36)	0.0067	0.0012	0.0000
mpriordef_CD*mtimesinceD_CD	L01	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time <= 1	1.5128	0.0415	0.0000
mpriordef_CD*mtimesinceD_CD	L01	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 2	1.3237	0.0421	0.0000
mpriordef_CD*mtimesinceD_CD	L01	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 3	1.1028	0.0428	0.0000
mpriordef_CD*mtimesinceD_CD	L01	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 4	0.7546	0.0441	0.0000
mpriordef_CD*mtimesinceD_CD	L01	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 5	0.5836	0.0453	0.0000
mpriordef_CD*mtimesinceD_CD	L01	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 6	0.4249	0.0466	0.0000
mpriordef_CD*mtimesinceD_CD	L01	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 7	0.3612	0.0477	0.0000
mpriordef_CD*mtimesinceD_CD	L01	L08	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 8	0.2248	0.0495	0.0000
mpriordef_CD*mtimesinceD_CD	L01	L09	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 9	0.1425	0.0513	0.0054
mpriordef_CD*mtimesinceD_CD	L01	L10	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 10	0.0707	0.0529	0.1819
mpriordef_CD*mtimesinceD_CD	L01	L11	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 11	0.0252	0.0545	0.6440

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mpriordef_CD*mtimesinceD_CD	L01	L12	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time >= 12	-0.0882	0.0454	0.0520
mpriordef_CD*mtimesinceD_CD	L02	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time <= 1	1.9303	0.0420	0.0000
mpriordef_CD*mtimesinceD_CD	L02	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 2	1.6715	0.0429	0.0000
mpriordef_CD*mtimesinceD_CD	L02	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 3	1.4526	0.0440	0.0000
mpriordef_CD*mtimesinceD_CD	L02	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 4	1.1007	0.0460	0.0000
mpriordef_CD*mtimesinceD_CD	L02	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 5	0.9095	0.0480	0.0000
mpriordef_CD*mtimesinceD_CD	L02	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 6	0.7330	0.0503	0.0000
mpriordef_CD*mtimesinceD_CD	L02	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 7	0.6351	0.0526	0.0000
mpriordef_CD*mtimesinceD_CD	L02	L08	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 8	0.5133	0.0555	0.0000
mpriordef_CD*mtimesinceD_CD	L02	L09	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 9	0.3550	0.0592	0.0000
mpriordef_CD*mtimesinceD_CD	L02	L10	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 10	0.4186	0.0602	0.0000
mpriordef_CD*mtimesinceD_CD	L02	L11	Interaction of categorical of prior_default_cnt	prior_default_cnt = 2; cx_time = 11	0.2638	0.0647	0.0000

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			and categorical of cx_time[1]				
mpriordef_CD*mtimesinceD_CD	L02	L12	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time >= 12	0.0429	0.0478	0.3690
mpriordef_CD*mtimesinceD_CD	L03	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time <= 1	2.2738	0.0417	0.0000
mpriordef_CD*mtimesinceD_CD	L03	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 2	1.9486	0.0421	0.0000
mpriordef_CD*mtimesinceD_CD	L03	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 3	1.7024	0.0425	0.0000
mpriordef_CD*mtimesinceD_CD	L03	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 4	1.3444	0.0434	0.0000
mpriordef_CD*mtimesinceD_CD	L03	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 5	1.1179	0.0445	0.0000
mpriordef_CD*mtimesinceD_CD	L03	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 6	0.9179	0.0457	0.0000
mpriordef_CD*mtimesinceD_CD	L03	L07	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 7	0.7687	0.0472	0.0000
mpriordef_CD*mtimesinceD_CD	L03	L08	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 8	0.5990	0.0492	0.0000
mpriordef_CD*mtimesinceD_CD	L03	L09	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 9	0.4086	0.0518	0.0000
mpriordef_CD*mtimesinceD_CD	L03	L10	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 10	0.3558	0.0536	0.0000

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mpriordef_CD*mtimesinceD_CD	L03	L11	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 11	0.3436	0.0553	0.0000
mpriordef_CD*mtimesinceD_CD	L03	L12	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time >= 12	0.0431	0.0462	0.3512
mpriordef_CD*mtimesinceD_CD	Z00	Z00	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	base level prior_default_cnt = 0; base level prior_default_cnt = 0			
vpriordef_cd_pw1			Variate piecewise of prior_default_cnt	median(0,prior_default_cnt-3,15-3)	0.0890	0.0015	0.0000
vtimesinced_cd_pw1			Variate piecwise of cx_time[1]	median(0,cx_time-12,24-12)	-0.0402	0.0025	0.0000
vtimesinced_cd_pw2			Variate piecwise of cx_time[1]	median(0,cx_time-24,40-24)	-0.0232	0.0028	0.0000
vsato_cd_pw1			Variate piecewise of sato (spread at origination)	min(0,sato-(-.1))	0.0519	0.0036	0.0000
vsato_cd_pw2			Variate piecewise of sato (spread at origination)	median(sato-(-.1),0,.7-(-.1))	0.0981	0.0300	0.0011
vperiodnbr_cd_pw1*mpriordef_ind	L01		Interaction of variate of piecewise of period_number and categorical of prior_default_cnt	median(0,period_number-8,40-8); prior_default_cnt ne 0	0.0073	0.0006	0.0000
vperiodnbr_cd_pw2*mpriordef_ind	L01		Interaction of variate of piecewise of period_number and categorical of prior_default_cnt	median(0,period_number-40,53-40); prior_default_cnt ne 0	0.0218	0.0021	0.0000
vperiodnbr_cd_pw3*mpriordef_ind	L01		Interaction of variate of piecewise of period_number and categorical of prior_default_cnt	median(0,period_number-53,68-53); prior_default_cnt ne 0	0.0126	0.0025	0.0000
vperiodnbr_cd_pw4*mpriordef_ind	L01		Interaction of variate of piecewise of period_number and categorical of prior_default_cnt	median(0,period_number-68,108-68); prior_default_cnt ne 0	0.0026	0.0009	0.0056
vperiodnbr_cd_pw*mpriordef_ind	Z00		Interaction of variate of piecewise of period_number and categorical of prior_default_cnt	base level: else; base level: else			

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mltv_cd	L01		Categorical of ltv_i_r[7] (loan-to-value)	ltv_i_r = .	-0.0710	0.0291	0.0146
mltv_cd	Z00		Categorical of ltv_i_r[7] (loan-to-value)	base level: else			
vltv_cd_pw1			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-0,70-0)	0.0057	0.0007	0.0000
vltv_cd_pw2			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-70,80-70)	0.0094	0.0011	0.0000
vltv_cd_pw3			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-80,94-80)	0.0056	0.0008	0.0000
vhpa2yb_cd_pw2			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-85,95-85)	-0.0105	0.0010	0.0000
vhpa2yb_cd_pw3			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-95,113-95)	-0.0105	0.0006	0.0000
vhpa2yb_cd_pw4			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-113,120-113)	-0.0040	0.0013	0.0021
vhpa2yb_cd_pw5			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-120,149-120)	-0.0097	0.0007	0.0000
vhpa2yb_cd_pw6			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-149,170-149)	-0.0172	0.0036	0.0000
vUEblend_cd_pw2			Variate piecewise of ue_blended_r[8] (change in unemployment rate)	median(0,ue_blended_r-420,820-420)	0.0001	0.0000	0.0000
vUEblend_cd_pw3			Variate piecewise of ue_blended_r[8] (change in unemployment rate)	median(0,ue_blended_r-820,1500-820)	0.0001	0.0000	0.0000
vdeltaUEpr3_cd_pw1			Variate piecewise of deltaueprr3_r[5] (change in unemployment from 3 quarters prior)	median(deltaueprr3_r-(-200),0,(-20)-(-200))	-0.0003	0.0001	0.0152
vdeltaUEpr3_cd_pw2			Variate piecewise of deltaueprr3_r[5] (change in unemployment from 3 quarters prior)	median(deltaueprr3_r-(-20),0,10-(-20))	0.0015	0.0002	0.0000
vdeltaUEpr3_cd_pw3			Variate piecewise of deltaueprr3_r[5] (change in unemployment from 3 quarters prior)	median(deltaueprr3_r-10,0,200-10)	0.0011	0.0001	0.0000

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mpriordef_ind*icredit_grp0_CD	L01	L000	Interaction of categorical of prior default indicator and categorical of credit_score	prior_default_cnt ne 0; credit_score=0	0.8931	0.0410	0.0000
mpriordef_ind*icredit_grp1_CD	L01	L450	Interaction of categorical of prior default indicator and categorical of credit_score	prior_default_cnt ne 0; credit_score<450	0.6916	0.1917	0.0003
mpriordef_ind*icredit_grp_CD	Z00	Z999	Interaction of categorical of prior default indicator and categorical of credit_score	base level: else; base level: else			
vcredit_cd_pw3*mpriordef_ind	L01		Interaction of variate piecewise of credit_score and categorical of prior default indicator	median(0,credit_score-500,600-500); prior_default_cnt ne 0	0.0046	0.0005	0.0000
vcredit_cd_pw4*mpriordef_ind	L01		Interaction of variate piecewise of credit_score and categorical of prior default indicator	median(0,credit_score-600,630-600); prior_default_cnt ne 0	0.0044	0.0010	0.0000
vcredit_cd_pw5*mpriordef_ind	L01		Interaction of variate piecewise of credit_score and categorical of prior default indicator	median(0,credit_score-630,680-630); prior_default_cnt ne 0	0.0079	0.0006	0.0000
vcredit_cd_pw6*mpriordef_ind	L01		Interaction of variate piecewise of credit_score and categorical of prior default indicator	median(0,credit_score-680,720-680); prior_default_cnt ne 0	0.0075	0.0011	0.0000
vcredit_cd_pw7*mpriordef_ind	L01		Interaction of variate piecewise of credit_score and categorical of prior default indicator	median(0,credit_score-720,745-720); prior_default_cnt ne 0	0.0085	0.0024	0.0004
vcredit_cd_pw8*mpriordef_ind	L01		Interaction of variate piecewise of credit_score and categorical of prior default indicator	median(0,credit_score-745,800-745); prior_default_cnt ne 0	0.0059	0.0018	0.0013
vcredit_cd_pw*mpriordef_ind	Z00		Interaction of variate piecewise of credit_score and categorical of	mpriordef_ind base level: else			

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			prior default indicator				
mseason_grp_CD	L02		Categorical of season	season = "spring"	-0.2680	0.0054	0.0000
mseason_grp_CD	L03		Categorical of season	season = "summer"	-0.0530	0.0051	0.0000
mseason_grp_CD	Z0104		Categorical of season	base level: else			
vCCI_CD_pw1			Variate piecewise of consumer confidence index	median(0,CCI_r-30,75-30)	-0.0016	0.0006	0.0039
vCCI_CD_pw2			Variate piecewise of consumer confidence index	median(0,CCI_r-75,110-75)	-0.0026	0.0003	0.0000
vCCI_CD_pw3			Variate piecewise of consumer confidence index	median(0,CCI_r-110,134-110)	-0.0032	0.0008	0.0000
vSBOI_CD_pw1			Variate piecewise of small business optimism index	median(0,SBOI_r-83,95-83)	-0.0039	0.0022	0.0800
vSBOI_CD_pw3			Variate piecewise of small business optimism index	median(0,SBOI_r-100,108-100)	-0.0258	0.0019	0.0000

Current Transition Model Parameters – ARM C_PRE

The model parameters for the ARM current to prepayment transition are shown below.

Table 44: Current to Prepayment Transition ARM Model Parameters

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept					-3.3836	0.1826	0.0000
mjudicial	1		Categorical of judicial (judicial state)	judicial = 1 , judicial state	-0.0666	0.0042	0.0000
mjudicial	2		Categorical of judicial (judicial state)	base level: else, non-judicial state			
mdpa_govt	LGovt		Categorical of dpa (down payment assistance)	dpa = "govt"	-0.3619	0.0336	0.0000
mdpa_govt	Zothr		Categorical of dpa (down payment assistance)	base level: else			
mdpa_nprof	LNPro		Categorical of dpa (down payment assistance)	dpa= "nonprof"	-0.2304	0.0107	0.0000
mdpa_nprof	Zothr		Categorical of dpa (down payment assistance)	base level: else			
mycslope_CPRE	L01		Categorical of Yield Curve Slope	1<=ycslope<=2	0.1728	0.0054	0.0000

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mycslope_CPRE	Z00		Categorical of Yield Curve Slope	base level: else			
mfrst_tm_by	1		Categorical of frst_tm_by (first-time buyer)	frst_tm_by = "Y"	-0.0596	0.0051	0.0000
mfrst_tm_by	2		Categorical of frst_tm_by (first-time buyer)	base level: else			
mrfnc_ind	2		Categorical of rfnc_ind (refinanced loan indicator)	frnc_ind = "Y"	-0.1337	0.0075	0.0000
mrfnc_ind	3		Categorical of rfnc_ind (refinanced loan indicator)	base level: else			
mcalperiod_CPRE	L200104		Categorical of Calendar Period	period < 200604	0.6690	0.0121	0.0000
mcalperiod_CPRE	L200604		Categorical of Calendar Period	period = 200604	1.0317	0.0167	0.0000
mcalperiod_CPRE	L200701		Categorical of Calendar Period	period = 200701	1.0145	0.0176	0.0000
mcalperiod_CPRE	L200702		Categorical of Calendar Period	period = 200702	1.1490	0.0165	0.0000
mcalperiod_CPRE	L200703		Categorical of Calendar Period	period = 200703	0.8673	0.0184	0.0000
mcalperiod_CPRE	Z201800		Categorical of Calendar Period	base level: else			
mperiodnbr_CPRE	L02		Categorical of period_number	period_number = 2	-1.8055	0.0223	0.0000
mperiodnbr_CPRE	L03		Categorical of period_number	period_number = 3	-1.0299	0.0157	0.0000
mperiodnbr_CPRE	L04		Categorical of period_number	period_number = 4	-0.6242	0.0133	0.0000
mperiodnbr_CPRE	L05		Categorical of period_number	period_number = 5	-0.2815	0.0117	0.0000
mperiodnbr_CPRE	L06		Categorical of period_number	period_number = 6	-0.2095	0.0114	0.0000
mperiodnbr_CPRE	L07		Categorical of period_number	period_number = 7	-0.2022	0.0115	0.0000
mperiodnbr_CPRE	Z08		Categorical of period_number	base level: else			
vperiodnbr_CPRE_pw1			Variate piecewise of period_number	median(0,period_number-8,40-8)	-0.0081	0.0003	0.0000
vperiodnbr_CPRE_pw2			Variate piecewise of period_number	median(0,period_number-40,53-40)	-0.0337	0.0012	0.0000
vperiodnbr_CPRE_pw3			Variate piecewise of period_number	median(0,period_number-53,68-53)	0.0179	0.0018	0.0000
vperiodnbr_CPRE_pw4			Variate piecewise of period_number	median(0,period_number-68,108-68)	-0.0152	0.0014	0.0000
mperiodnbr_CPRE*mdpa_nprof	L02	LNPro	Interaction of Categorical of period_number and Categorical of dpa	period_number = 2; dpa= "nonprof"	-0.7542	0.1066	0.0000
mperiodnbr_CPRE*mdpa_nprof	L03	LNPro	Interaction of Categorical of	period_number = 3; dpa= "nonprof"	-0.8450	0.0738	0.0000

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			period_number and Categorical of dpa				
mperiodnbr_CPRE*mdpa_nprof	L04	LNPro	Interaction of Categorical of period_number and Categorical of dpa	period_number = 4; dpa= "nonprof"	-0.5842	0.0542	0.0000
mperiodnbr_CPRE*mdpa_nprof	L05	LNPro	Interaction of Categorical of period_number and Categorical of dpa	period_number = 5; dpa= "nonprof"	-0.2858	0.0408	0.0000
mperiodnbr_CPRE*mdpa_nprof	L06	LNPro	Interaction of Categorical of period_number and Categorical of dpa	period_number = 6; dpa= "nonprof"	-0.1398	0.0378	0.0002
mperiodnbr_CPRE*mdpa_nprof	L07	LNPro	Interaction of Categorical of period_number and Categorical of dpa	period_number = 7; dpa= "nonprof"	-0.1651	0.0389	0.0000
mperiodnbr_CPRE*mdpa_nprof	Z08	Zothr	Interaction of Categorical of period_number and Categorical of dpa	base level: else; base level: else			
vperiodnbr_CPRE_pw1*mpriordef_ind	L01		Interaction of variate of piecewise of period_number and categorical of prior_default_cnt	median(0,period_number-8,40-8); prior_default_cnt ne 0	0.0086	0.0008	0.0000
vperiodnbr_CPRE_pw2*mpriordef_ind	L01		Interaction of variate of piecewise of period_number and categorical of prior_default_cnt	median(0,period_number-40,53-40); prior_default_cnt ne 0	0.0281	0.0020	0.0000
vperiodnbr_CPRE_pw3*mpriordef_ind	L01		Interaction of variate of piecewise of period_number and categorical of prior_default_cnt	median(0,period_number-53,68-53); prior_default_cnt ne 0	-0.0366	0.0028	0.0000
vperiodnbr_CPRE_pw4*mpriordef_ind	L01		Interaction of variate of piecewise of period_number and categorical of prior_default_cnt	median(0,period_number-68,108-68); prior_default_cnt ne 0	0.0072	0.0017	0.0000
vperiodnbr_CPRE_pw*mpriordef_ind	Z00		Interaction of variate of piecewise of period_number and categorical of prior_default_cnt	base level: else; base level: else			

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
vcredit_CPRE_pw1			Variate piecewise of credit_score	0<credit_score<=450	-0.6147	0.1695	0.0003
vcredit_CPRE_pw2			Variate piecewise of credit_score	median(0,credit_score-450,500-450)	-0.0091	0.0009	0.0000
vcredit_CPRE_pw3			Variate piecewise of credit_score	median(0,credit_score-500,600-500)	0.0021	0.0005	0.0000
vcredit_CPRE_pw5			Variate piecewise of credit_score	median(0,credit_score-630,680-630)	0.0047	0.0003	0.0000
vcredit_CPRE_pw6			Variate piecewise of credit_score	median(0,credit_score-680,720-680)	0.0041	0.0003	0.0000
vcredit_CPRE_pw8			Variate piecewise of credit_score	median(0,credit_score-745,800-745)	0.0026	0.0003	0.0000
vcredit_CPRE_pw2*mpriordef_ind	L01		Interaction of variate piecewise of credit_score and categorical of prior default indicator	median(0,credit_score-450,500-450); prior_default_cnt ne 0	-0.0066	0.0007	0.0000
vcredit_CPRE_pw4*mpriordef_ind	L01		Interaction of variate piecewise of credit_score and categorical of prior default indicator	median(0,credit_score-600,630-600); prior_default_cnt ne 0	0.0054	0.0012	0.0000
vcredit_CPRE_pw*mpriordef_ind	Z00		Interaction of variate piecewise of credit_score and categorical of prior default indicator	mpriordef_ind base level: else			
vdeltaUEinit_CPRE_pw1			Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-0,90-0)	-0.0007	0.0002	0.0011
vdeltaUEinit_CPRE_pw3			Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-97,100-97)	-0.0236	0.0021	0.0000
vdeltaUEinit_CPRE_pw5			Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-110,140-110)	0.0015	0.0003	0.0000
vdeltaUEinit_CPRE_pw7			Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-175,200-175)	0.0019	0.0006	0.0015

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
vdeltaUEinit_CPRE_pw8			Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-200,300-200)	-0.0009	0.0004	0.0147
mRatioTmpTei_CPRE	L00		Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	-0.1652	0.0137	0.0000
mRatioTmpTei_CPRE	Z01		Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_CPRE_pw1			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,24-0)	-0.0068	0.0006	0.0000
vratiotmptei_CPRE_pw2			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-24,36-24)	-0.0112	0.0007	0.0000
vratiotmptei_CPRE_pw3			Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-36,50-36)	-0.0056	0.0012	0.0000
mpriordef_CPRE*mtimesinceD_CPRE	L01	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time <= 1	-0.4024	0.0238	0.0000
mpriordef_CPRE*mtimesinceD_CPRE	L01	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 2	-0.5099	0.0275	0.0000
mpriordef_CPRE*mtimesinceD_CPRE	L01	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 3	-0.4833	0.0299	0.0000
mpriordef_CPRE*mtimesinceD_CPRE	L01	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 4	-0.3963	0.0308	0.0000
mpriordef_CPRE*mtimesinceD_CPRE	L01	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time = 5	-0.3089	0.0314	0.0000
mpriordef_CPRE*mtimesinceD_CPRE	L01	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 1; cx_time >= 6	-0.2876	0.0191	0.0000
mpriordef_CPRE*mtimesinceD_CPRE	L02	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time <= 1	-0.4520	0.0321	0.0000

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
mpriordef_CPRE*mtimesinceD_CPRE	L02	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 2	-0.5889	0.0386	0.0000
mpriordef_CPRE*mtimesinceD_CPRE	L02	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 3	-0.5064	0.0416	0.0000
mpriordef_CPRE*mtimesinceD_CPRE	L02	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 4	-0.3552	0.0424	0.0000
mpriordef_CPRE*mtimesinceD_CPRE	L02	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time = 5	-0.3695	0.0459	0.0000
mpriordef_CPRE*mtimesinceD_CPRE	L02	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt = 2; cx_time >= 6	-0.3738	0.0235	0.0000
mpriordef_CPRE*mtimesinceD_CPRE	L03	L01	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time <= 1	-0.6444	0.0314	0.0000
mpriordef_CPRE*mtimesinceD_CPRE	L03	L02	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 2	-0.6970	0.0361	0.0000
mpriordef_CPRE*mtimesinceD_CPRE	L03	L03	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 3	-0.7164	0.0407	0.0000
mpriordef_CPRE*mtimesinceD_CPRE	L03	L04	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 4	-0.5193	0.0413	0.0000
mpriordef_CPRE*mtimesinceD_CPRE	L03	L05	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time = 5	-0.4832	0.0438	0.0000
mpriordef_CPRE*mtimesinceD_CPRE	L03	L06	Interaction of categorical of prior_default_cnt and categorical of cx_time[1]	prior_default_cnt >= 3; cx_time >= 6	-0.4574	0.0251	0.0000
mpriordef_CPRE*mtimesinceD_CPRE	Z00	Z00	Interaction of categorical of prior_default_cnt	base level prior_default_cnt = 0; base level prior_default_cnt = 0			

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
			and categorical of cx_time[1]				
vpriordef_CPRE_pw1			Variate piecewise of prior_default_cnt	median(0,prior_default_cnt-3,15-3)	-0.0223	0.0047	0.0000
vsato_CPre_pw1			Variate piecewise of sato (spread at origination)	min(0,sato-(-.1))	0.0530	0.0034	0.0000
vsato_CPre_pw2			Variate piecewise of sato (spread at origination)	median(sato-(-.1),0,.7-(-.1))	0.1225	0.0299	0.0000
vloanraw_CPRE_pw1			Variate piecewise of loansize_raw	median(0,loansize_raw-0,64000-0)	0.0000	0.0000	0.0000
vloanraw_CPRE_pw2			Variate piecewise of loansize_raw	median(0,loansize_raw-64000,157000-64000)	0.0000	0.0000	0.0000
vloanraw_CPRE_pw3			Variate piecewise of loansize_raw	median(0,loansize_raw-157000,425000-157000)	0.0000	0.0000	0.0000
mltv_CPRE	L01		Categorical of ltv_i_r[7] (loan-to-value)	ltv_i_r = .	0.2403	0.0313	0.0000
mltv_CPRE	Z00		Categorical of ltv_i_r[7] (loan-to-value)	base level: else			
vltv_CPRE_pw1			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-0,70-0)	-0.0098	0.0008	0.0000
vltv_CPRE_pw2			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-70,80-70)	0.0175	0.0011	0.0000
vltv_CPRE_pw3			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-80,94-80)	-0.0208	0.0007	0.0000
vltv_CPRE_pw4			Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-94,100-94)	-0.1433	0.0042	0.0000
vhpa2yb_CPRE_pw1			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-0,85-0)	-0.0122	0.0020	0.0000
vhpa2yb_CPRE_pw2			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-85,95-85)	0.0147	0.0025	0.0000
vhpa2yb_CPRE_pw3			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-95,113-95)	0.0370	0.0007	0.0000
vhpa2yb_CPRE_pw4			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-113,120-113)	0.0178	0.0010	0.0000
vhpa2yb_CPRE_pw5			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-120,149-120)	0.0220	0.0004	0.0000
vhpa2yb_CPRE_pw6			Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-149,170-149)	0.0137	0.0012	0.0000
vUEblend_CPRE_pw1			Variate piecewise of ue_blended_r[8] (change in unemployment rate)	median(0,ue_blended_r-0,420-0)	-0.0013	0.0001	0.0000

Variable	ClassVal0	ClassVal1	Description	Description Detail	Estimate	StdErr	ProbChiSq
vUEblend_CPRE_pw2			Variate piecewise of ue_blended_r^{8} (change in unemployment rate)	median(0,ue_blended_r-420,820-420)	-0.0006	0.0000	0.0000
vUEblend_CPRE_pw3			Variate piecewise of ue_blended_r^{8} (change in unemployment rate)	median(0,ue_blended_r-820,1500-820)	-0.0009	0.0001	0.0000
vdeltaUEpr3_cpre_pw1			Variate piecewise of deltauepr3_r^{5} (change in unemployment from 3 quarters prior)	median(deltauepr3_r-(-200),0,(-20)-(-200))	0.0020	0.0001	0.0000
vdeltaUEpr3_cpre_pw2			Variate piecewise of deltauepr3_r^{5} (change in unemployment from 3 quarters prior)	median(deltauepr3_r-(-20),0,10-(-20))	0.0045	0.0002	0.0000
vdeltaUEpr3_cpre_pw3			Variate piecewise of deltauepr3_r^{5} (change in unemployment from 3 quarters prior)	median(deltauepr3_r-10,0,200-10)	0.0018	0.0001	0.0000
mseason_grp_CPRE	L02		Categorical of season	season = "spring"	0.1505	0.0048	0.0000
mseason_grp_CPRE	L03		Categorical of season	season = "summer"	0.1896	0.0048	0.0000
mseason_grp_CPRE	Z0104		Categorical of season	base level: else			
vCCI_CPRE_pw1			Variate piecewise of consumer confidence index	median(0,CCI_r-30,75-30)	0.0078	0.0009	0.0000
vCCI_CPRE_pw2			Variate piecewise of consumer confidence index	median(0,CCI_r-75,110-75)	-0.0096	0.0003	0.0000
vCCI_CPRE_pw3			Variate piecewise of consumer confidence index	median(0,CCI_r-110,134-110)	-0.0023	0.0008	0.0032
vSBOI_CPRE_pw1			Variate piecewise of small business optimism index	median(0,SBOI_r-83,95-83)	0.0375	0.0032	0.0000
vSBOI_CPRE_pw2			Variate piecewise of small business optimism index	median(0,SBOI_r-95,100-95)	0.0145	0.0023	0.0000

Default Transition Model Parameters – FRM30NSR D_CLM

The model parameters for the FRM30NSR default to claim transition are shown below.

Table 45: Default to Claim Transition FRM30NSR Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				-5.3679	0.0401	<.0001
mrfnc_ind	2	Categorical of rfnc_ind (refinanced loan indicator)	rfnc_ind = "N"	0.2141	0.00443	<.0001
mrfnc_ind	3	Categorical of rfnc_ind (refinanced loan indicator)	base level: else			
mDeltaTm3_DCLM	L01	Categorical of DeltaTm3Init_r^{12} (change in 3 month treasury from policy inception to current)	DeltaTm3Init_r^{12} > 600	-0.3706	0.00594	<.0001
mDeltaTm3_DCLM	Z00	Categorical of DeltaTm3Init_r^{12} (change in 3 month treasury from policy inception to current)	base level: else			
mseason	1	Categorical of season	season = "winter"	0.0182	0.00311	<.0001
mseason	2	Categorical of season	season = "spring"	0.0712	0.0031	<.0001
mseason	3	Categorical of season	season = "summer"	0.0758	0.00307	<.0001
mseason	4	Categorical of season	base level: season = "fall"			
mjudicial	1	Categorical of judicial (judicial state)	judicial = 1 (yes)	-0.2017	0.00227	<.0001
mjudicial	2	Categorical of judicial (judicial state)	base level: else			
mdpa	1	Categorical of dpa (down payment assistance)	dpa = "govt"	0.128	0.00707	<.0001
mdpa	2	Categorical of dpa (down payment assistance)	base level: else	0.4185	0.00345	<.0001
mdpa	3	Categorical of dpa (down payment assistance)	dpa = "Relative"	-0.0176	0.00351	<.0001
mdpa_rel	ZOthr	Categorical of dpa (down payment assistance)	base level: else			
mfrst_tm_by	1	Categorical of frst_tm_by (first-time buyer)	frst_tm_by = "Y"	-0.1124	0.00313	<.0001
mfrst_tm_by	2	Categorical of frst_tm_by (first-time buyer)	base level: else			

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mhpa2yb_DCLM	L085	Categorical of hpa2y_blended_r[6]	hpa2y_blended_r <= 80	0.1466	0.0104	<.0001
mhpa2yb_DCLM	Z000	Categorical of hpa2y_blended_r[7]	base level: else			
vhpa2yb_DCLM_pw1		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-80,98-80)	-0.0105	0.000505	<.0001
vhpa2yb_DCLM_pw2		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-98,108-98)	0.0437	0.000479	<.0001
vhpa2yb_DCLM_pw3		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-108,117-108)	-0.018	0.000457	<.0001
vhpa2yb_DCLM_pw4		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-117,180-117)	-0.0142	0.000377	<.0001
mperiodnbr_DCLM	L02	Categorical of period_number	period number <= 2	-1.2898	0.1435	<.0001
mperiodnbr_DCLM	L03	Categorical of period_number	period number = 3	-0.9782	0.043	<.0001
mperiodnbr_DCLM	L04	Categorical of period_number	period number = 4	-0.3877	0.0201	<.0001
mperiodnbr_DCLM	Z05	Categorical of period_number	base level: else			
vperiodnbr_DCLM_pw1		Variate piecewise of period_number	median(0,period_number-5,9-5)	0.0595	0.00221	<.0001
vperiodnbr_DCLM_pw2		Variate piecewise of period_number	median(0,period_number-9,17-9)	0.0211	0.000652	<.0001
vperiodnbr_DCLM_pw3		Variate piecewise of period_number	median(0,period_number-17,60-17)	0.00149	0.000203	<.0001
vperiodnbr_DCLM_pw4		Variate piecewise of period_number	median(0,period_number-60,86-60)	-0.00847	0.000705	<.0001
mcredit_DCLM	L01	Categorical of credit_score	credit_score = 0	0.0495	0.00549	<.0001
mcredit_DCLM	Z00	Categorical of credit_score	base level: else			
vcredit_DCLM_pw1		Variate piecewise of credit_score	median(0,credit_score-525,635-525)	0.000932	0.000056	<.0001
vcredit_DCLM_pw2		Variate piecewise of credit_score	median(0,credit_score-635,780-635)	0.0044	0.000049	<.0001
mdurdefepi_DCLM	Z01	Categorical of dur_def_episode (duration of default episode)	Base level: dur_def_episode <= 1			
mdurdefepi_DCLM	L02	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 2	0.8523	0.00548	<.0001
mdurdefepi_DCLM	L03	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 3	1.3863	0.00532	<.0001
mdurdefepi_DCLM	L04	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 4	1.6283	0.00539	<.0001
mdurdefepi_DCLM	L05	Categorical of dur_def_episode	dur_def_episode = 5	1.722	0.00558	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		(duration of default episode)				
mdurdefepi_DCLM	L06	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 6	1.7261	0.00586	<.0001
mdurdefepi_DCLM	L07	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 7	1.7009	0.00618	<.0001
mdurdefepi_DCLM	L08	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 8	1.6702	0.00654	<.0001
mdurdefepi_DCLM	L09	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 9	1.6425	0.00694	<.0001
mdurdefepi_DCLM	L10	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 10	1.6159	0.00735	<.0001
mdurdefepi_DCLM	L11	Categorical of dur_def_episode (duration of default episode)	else	1.5936	0.00607	<.0001
vdurdefepi_DCLM_pw1		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-10,30-10)	-0.00868	0.000519	<.0001
vdurdefepi_DCLM_pw2		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-30,40-30)	-0.0576	0.00221	<.0001
vdeltaUEInit_DCLM_pw1		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-0,63-0)	-0.00576	0.000346	<.0001
vdeltaUEInit_DCLM_pw2		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-63,100-63)	0.00196	0.000147	<.0001
vdeltaUEInit_DCLM_pw3		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-100,116-100)	0.00325	0.000273	<.0001
vdeltaUEInit_DCLM_pw4		Variate piecewise of DeltaUEInit_r[4]	median(0,DeltaUEInit_r-116,218-116)	0.00136	0.000056	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		(change in unemployment rate from policy inception to current)				
mRatioTmpTei_DCLM	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	0.0629	0.0105	<.0001
mRatioTmpTei_DCLM	Z00	Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_DCLM_pw1		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,24-0)	0.00438	0.00038	<.0001
vratiotmptei_DCLM_pw2		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-24,36-24)	0.00421	0.000343	<.0001
vratiotmptei_DCLM_pw3		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-36,50-36)	-0.00895	0.000717	<.0001
mpriordef_DCLM	Z00	Categorical of prior_default_cnt	base level: prior_default_cnt = 0			
mpriordef_DCLM	L01	Categorical of prior_default_cnt	prior_default_cnt = 1	-0.2267	0.00297	<.0001
mpriordef_DCLM	L02	Categorical of prior_default_cnt	prior_default_cnt = 2	-0.3896	0.00399	<.0001
mpriordef_DCLM	L03	Categorical of prior_default_cnt	prior_default_cnt = 3	-0.5096	0.00511	<.0001
mpriordef_DCLM	L04	Categorical of prior_default_cnt	prior_default_cnt = 4	-0.6159	0.00644	<.0001
mpriordef_DCLM	L05	Categorical of prior_default_cnt	prior_default_cnt = 5	-0.7231	0.00814	<.0001
mpriordef_DCLM	L06	Categorical of prior_default_cnt	prior_default_cnt = 6	-0.8446	0.0104	<.0001
mpriordef_DCLM	L07	Categorical of prior_default_cnt	prior_default_cnt = 7	-0.9356	0.0133	<.0001
mpriordef_DCLM	L08	Categorical of prior_default_cnt	prior_default_cnt = 8	-1.0252	0.0173	<.0001
mpriordef_DCLM	L09	Categorical of prior_default_cnt	prior_default_cnt = 9	-1.104	0.0226	<.0001
mpriordef_DCLM	L10	Categorical of prior_default_cnt	prior_default_cnt = 10	-1.1482	0.0296	<.0001
mpriordef_DCLM	L11	Categorical of prior_default_cnt	prior_default_cnt = 11	-1.2645	0.0403	<.0001
mpriordef_DCLM	L12	Categorical of prior_default_cnt	prior_default_cnt >= 12	-1.4973	0.0392	<.0001
vUEblend_DCLM_pw1		Variate piecewise of ue_blended_r^8 (unemployment rate)	median(0,ue_blended_r^8-200,450-200)	0.00131	0.000035	<.0001
vUEblend_DCLM_pw2		Variate piecewise of ue_blended_r^8 (unemployment rate)	median(0,ue_blended_r^8-450,850-450)	-0.00059	0.000012	<.0001
vUEblend_DCLM_pw3		Variate piecewise of ue_blended_r^8 (unemployment rate)	median(0,ue_blended_r^8-850,1500-850)	-0.00012	0.000015	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vltv_DCLM_pw1		Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-0,70-0)	0.00562	0.000467	<.0001
vltv_DCLM_pw2		Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-70,81-70)	0.027	0.00062	<.0001
vltv_DCLM_pw3		Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-81,91-81)	0.0132	0.000528	<.0001
vltv_DCLM_pw4		Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-91,94-91)	0.0466	0.00151	<.0001
vltv_DCLM_pw5		Variate piecewise of ltv_i_r^7 (loan-to-value)	max(0,ltv_i_r-94)	0.1003	0.00215	<.0001
vloanraw_DCLM_pw1		Variate piecewise of loansize_raw	median(0,loansize_raw-27000,65000-27000)	-1.28E-06	1.88E-07	<.0001
vloanraw_DCLM_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-65000,120000-65000)	7.44E-07	6.87E-08	<.0001
vloanraw_DCLM_pw3		Variate piecewise of loansize_raw	median(0,loansize_raw-120000,500000-120000)	-1.42E-06	2.54E-08	<.0001
mDeltaTY10_DCLM	L01	Categorical of DeltaTy10Init_r^2 (10 year treasury rate)	DeltaTy10Init_r^2 < 53	0.1223	0.0034	<.0001
mDeltaTY10_DCLM	L02	Categorical of DeltaTy10Init_r^2 (10 year treasury rate)	DeltaTy10Init_r^2> 130	-0.363	0.00972	<.0001
mDeltaTY10_DCLM	Z00	Categorical of DeltaTy10Init_r^2 (10 year treasury rate)	base level: else			
mprior3_ue_DCLM	L01	Categorical of prior3_ue_r^{11} (state unemployment 3 prior quarters)	prior3_ue_r^{11}<1400	-0.4479	0.0163	<.0001
mprior3_ue_DCLM	Z00	Categorical of prior3_ue_r^{11} (state unemployment 3 prior quarters)	base level: else			
mcalperiod_DCLM	L02	Categorical of Calendar Period	period < 199704	0.3487	0.00936	<.0001
mcalperiod_DCLM	z	Categorical of Calendar Period	base level: else			
mTY30_DCLM	L01	Categorical of treasury_yr_30 (30 year treasury rate)	treasury_yr_30>6	0.2393	0.0079	<.0001
mTY30_DCLM	Z00	Categorical of treasury_yr_30 (30 year treasury rate)	base level: else			

Default Transition Model Parameters – FRM30NSR D_CXM

The model parameters for the FRM30NSR default to modified cure transition are shown below.

Table 46: Default to Modified Cure Transition FRM30NSR Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				-6.2059	0.0489	<.0001
mcalperiod_DCXM	L01	Categorical of Calendar Period	period < 200604	-6.6094	0.0544	<.0001
mcalperiod_DCXM	z	Categorical of Calendar Period	base level: else			
mseason	1	Categorical of season	season = "winter"	-0.00645	0.0034	0.0581
mseason	2	Categorical of season	season = "spring"	0.1672	0.00328	<.0001
mseason	3	Categorical of season	season = "summer"	0.113	0.00332	<.0001
mseason	4	Categorical of season	base level: season = "fall"			
mjudicial	1	Categorical of judicial (judicial state)	judicial = 1 (yes)	-0.0676	0.00244	<.0001
mjudicial	2	Categorical of judicial (judicial state)	base level: else			
mdpa_govt	LGovt	Categorical of dpa (down payment assistance)	dpa = "govt"	-0.0675	0.00724	<.0001
mdpa_govt	ZOthr	Categorical of dpa (down payment assistance)	base level: else			
mdpa_rel	LRela	Categorical of dpa (down payment assistance)	dpa = "Relative"	-0.0456	0.00327	<.0001
mdpa_rel	ZOthr	Categorical of dpa (down payment assistance)	base level: else			
mfrst_tm_by	1	Categorical of frst_tm_by (first-time buyer)	frst_tm_by = "Y"	0.061	0.00288	<.0001
mfrst_tm_by	2	Categorical of frst_tm_by (first-time buyer)	base level: else			
mycslope_DCXM	L01	Categorical of ycslope_r^9 (yield curve slope)	ycslope_r<=300	0.0696	0.00469	<.0001
mycslope_DCXM	L02	Categorical of ycslope_r^9 (yield curve slope)	ycslope_r>=900	-0.1541	0.00396	<.0001
mycslope_DCXM	L03	Categorical of ycslope_r^9 (yield curve slope)	ycslope_r>=1500	-0.1272	0.00387	<.0001
mycslope_DCXM	Z00	Categorical of ycslope_r^9 (yield curve slope)	base level: else			
mhpa2yb_DCXM	L085	Categorical of hpa2y_blended_r^6	hpa2y_blended_r^6 <= 85	-0.0629	0.0057	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mhpa2yb_DCXM	Z000	Categorical of hpa2y_blended_r[6]	base level: else			
vhpa2yb_DCXM_pw2		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-106,111-106)	0.00468	0.00093	<.0001
vhpa2yb_DCXM_pw3		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-111,121-111)	0.0105	0.000649	<.0001
vhpa2yb_DCXM_pw4		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-121,180-121)	0.00541	0.000684	<.0001
mperiodnbr_DCXM	L02	Categorical of period_number	period_number <= 2	-0.8846	0.1113	<.0001
mperiodnbr_DCXM	L03	Categorical of period_number	eriod_number = 3 , else mperiodnbr_DCXM="Z04"	-0.2622	0.0337	<.0001
mperiodnbr_DCXM	Z04	Categorical of period_number	base level: else			
vperiodnbr_DCXM_pw1		Variate piecewise of period_number	median(0,period_number-4,9-4)	0.2144	0.00233	<.0001
vperiodnbr_DCXM_pw2		Variate piecewise of period_number	median(0,period_number-9,15-9)	-0.0402	0.00102	<.0001
vperiodnbr_DCXM_pw3		Variate piecewise of period_number	median(0,period_number-15,25-15)	0.00647	0.000545	<.0001
vperiodnbr_DCXM_pw4		Variate piecewise of period_number	median(0,period_number-25,59-25)	-0.00412	0.000257	<.0001
vperiodnbr_DCXM_pw5		Variate piecewise of period_number	median(0,period_number-59,90-59)	-0.00387	0.000566	<.0001
mcredit_DCXM	L01	Categorical of credit_score	credit_score = 0, else mcredit_DCXM = "Z00"	-0.0372	0.0052	<.0001
mcredit_DCXM	Z00	Categorical of credit_score	base level: else			
vcredit_DCXM_pw1		Variate piecewise of credit_score	median(0,credit_score-530,640-530)	-0.0021	0.000052	<.0001
vcredit_DCXM_pw2		Variate piecewise of credit_score	median(0,credit_score-640,680-640)	-0.00165	0.000128	<.0001
vcredit_DCXM_pw3		Variate piecewise of credit_score	median(0,credit_score-680,780-680)	-0.00194	0.000112	<.0001
mdurdefepi_DCXM	Z01	Categorical of dur_def_episode (duration of default episode)	base level: dur_def_episode <=1			
mdurdefepi_DCXM	L02	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 2	0.5106	0.00375	<.0001
mdurdefepi_DCXM	L03	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 3	0.6766	0.00395	<.0001
mdurdefepi_DCXM	L04	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 4	0.6805	0.00431	<.0001
mdurdefepi_DCXM	L05	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 5	0.611	0.00481	<.0001
mdurdefepi_DCXM	L06	Categorical of dur_def_episode	dur_def_episode = 6	0.5063	0.00544	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		(duration of default episode)				
mdurdefepi_DCXM	L07	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 7	0.3743	0.00624	<.0001
mdurdefepi_DCXM	L08	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 8	0.2596	0.00713	<.0001
mdurdefepi_DCXM	L09	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 9	0.1321	0.0082	<.0001
mdurdefepi_DCXM	L10	Categorical of dur_def_episode (duration of default episode)	dur_def_episode >= 10	-0.1111	0.00672	<.0001
vdurdefepi_DCXM_pw1		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-10,23-10)	-0.0652	0.00114	<.0001
vdurdefepi_DCXM_pw2		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-23,40-23)	0.00973	0.00186	<.0001
vdeltaUEInit_DCXM_pw1		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-0,66-0)	0.00616	0.00027	<.0001
vdeltaUEInit_DCXM_pw2		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-66,95-66)	-0.00301	0.000168	<.0001
vdeltaUEInit_DCXM_pw3		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-95,230-95)	0.000556	0.000045	<.0001
vdeltaUEInit_DCXM_pw4		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-230,300-230)	-0.00048	0.000151	0.0014
mRatioTmpTei_DCXM	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0, else MRatioTmpTei_DCXM = "Z00"	0.8468	0.0335	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mRatioTmpTei_DCXM	Z00	Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_DCXM_pw1		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,14-0)	0.0408	0.00215	<.0001
vratiotmptei_DCXM_pw2		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-14,26-14)	0.0223	0.000413	<.0001
vratiotmptei_DCXM_pw3		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-26,44-26)	0.00484	0.000287	<.0001
vratiotmptei_DCXM_pw4		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-44,52-44)	-0.0232	0.00239	<.0001
mpriordef_DCXM	Z00	Categorical of prior_default_cnt	base level: prior_default_cnt = 0			
mpriordef_DCXM	L01	Categorical of prior_default_cnt	prior_default_cnt = 1	0.1785	0.00341	<.0001
mpriordef_DCXM	L02	Categorical of prior_default_cnt	prior_default_cnt = 2	0.2364	0.00394	<.0001
mpriordef_DCXM	L03	Categorical of prior_default_cnt	prior_default_cnt = 3	0.2747	0.00458	<.0001
mpriordef_DCXM	L04	Categorical of prior_default_cnt	prior_default_cnt = 4	0.2881	0.00535	<.0001
mpriordef_DCXM	L05	Categorical of prior_default_cnt	prior_default_cnt = 5	0.2864	0.0063	<.0001
mpriordef_DCXM	L06	Categorical of prior_default_cnt	prior_default_cnt = 6	0.2621	0.0075	<.0001
mpriordef_DCXM	L07	Categorical of prior_default_cnt	prior_default_cnt = 7	0.2408	0.00905	<.0001
mpriordef_DCXM	L08	Categorical of prior_default_cnt	prior_default_cnt = 8	0.2103	0.0111	<.0001
mpriordef_DCXM	L09	Categorical of prior_default_cnt	prior_default_cnt = 9	0.1613	0.0139	<.0001
mpriordef_DCXM	L10	Categorical of prior_default_cnt	prior_default_cnt = >10	0.1542	0.015	<.0001
vpriordef_DCXM_pw1		Variate of prior_default_cnt	median(0,prior_default_cnt-10,16-10)	-0.0616	0.00718	<.0001
vsato_DCXM_pw1		Variate piecewise of sato (spread at origination)	min(0,sato-(-.6))	0.2738	0.0103	<.0001
vsato_DCXM_pw2		Variate piecewise of sato (spread at origination)	median(sato-(-.6),0,.9-(-.6))	0.0817	0.00319	<.0001
vsato_DCXM_pw3		Variate piecewise of sato (spread at origination)	median(sato-.9,0,1.82-.9)	-0.0995	0.0116	<.0001
vltv_DCXM_pw1		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-0,69-0)	0.00396	0.000478	<.0001
vltv_DCXM_pw2		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-69,80-69)	0.00218	0.000647	0.0007
vltv_DCXM_pw3		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-80,85-80)	0.00379	0.00117	0.0012

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vltv_DCXM_pw4		Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-85,91-85)	0.00925	0.000927	<.0001
vltv_DCXM_pw5		Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-91,94-91)	-0.0242	0.00199	<.0001
vltv_DCXM_pw6		Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-94,99-94)	0.0928	0.00367	<.0001
vloanraw_DCXM_pw1		Variate piecewise of loansize_raw	median(0,loansize_raw-0,70000-0)	8.00E-06	2.65E-07	<.0001
vloanraw_DCXM_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-70000,98000-70000)	5.73E-06	1.80E-07	<.0001
vloanraw_DCXM_pw3		Variate piecewise of loansize_raw	median(0,loansize_raw-98000,180000-98000)	1.60E-06	5.27E-08	<.0001
vloanraw_DCXM_pw4		Variate piecewise of loansize_raw	median(0,loansize_raw-180000,500000-180000)	1.47E-07	2.95E-08	<.0001
mDeltaTY10_DCXM	L01	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r < 53	-0.214	0.00354	<.0001
mDeltaTY10_DCXM	L02	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r > 108, else mDeltaTY10_DCXM = "Z00"	0.0573	0.00464	<.0001
mDeltaTY10_DCXM	Z00	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	base level: else			
vSBOI_DCXM_pw1		Variate piecewise of SBOI (small business optimism index)	median(0,mSBOI-85,100-85)	-0.00535	0.000543	<.0001
vSBOI_DCXM_pw2		Variate piecewise of SBOI (small business optimism index)	median(0,mSBOI-100,108-100)	-0.0438	0.000932	<.0001

Default Transition Model Parameters – FRM30NSR D_CXS

The model parameters for the FRM30NSR default to self-cure transition are shown below.

Table 47: Default to Self-Cure Transition FRM30NSR Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				0.714	0.0161	<.0001
mseason	1	Categorical of season	season = "winter"	0.2213	0.00151	<.0001
mseason	2	Categorical of season	season = "spring"	0.2706	0.00153	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mseason	3	Categorical of season	season = "summer"	0.1007	0.0016	<.0001
mseason	4	Categorical of season	base level: season = "fall"			
mjudicial	1	Categorical of judicial (judicial state)	judicial = 1 (yes)	-0.119	0.00111	<.0001
mjudicial	2	Categorical of judicial (judicial state)	base level: else			
mdpa_rel	LRela	Categorical of dpa (down payment assistance)	dpa = "Relative"	0.0563	0.00146	<.0001
mdpa_rel	ZOthr	Categorical of dpa (down payment assistance)	base level: else			
mfrst_tm_by	1	Categorical of frst_tm_by (first-time buyer)	frst_tm_by = "Y"	0.0405	0.0013	<.0001
mfrst_tm_by	2	Categorical of frst_tm_by (first-time buyer)	base level: else			
mycslope_DCXS	L01	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r<=111	0.0129	0.00194	<.0001
mycslope_DCXS	L02	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r>=2000	0.0585	0.00193	<.0001
mycslope_DCXS	L03	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r>=875	0.0288	0.00237	<.0001
mycslope_DCXS	Z00	Categorical of ycslope_r[9] (yield curve slope)	base level: else			
mhpa2yb_DCXS	L080	Categorical of hpa2y_blended_r[6]	hpa2y_blended_r <= 80	-0.0494	0.00534	<.0001
mhpa2yb_DCXS	Z000	Categorical of hpa2y_blended_r[6]	base level: else			
vhpa2yb_DCXS_pw1		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-80,99-80)	0.0134	0.000228	<.0001
vhpa2yb_DCXS_pw2		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-99,105-99)	-0.0164	0.000425	<.0001
vhpa2yb_DCXS_pw3		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-105,115-105)	0.0073	0.000206	<.0001
vhpa2yb_DCXS_pw4		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-115,180-115)	0.00312	0.00016	<.0001
mperiodnbr_DCXS	L02	Categorical of period_number	period_number <= 2	1.2972	0.0115	<.0001
mperiodnbr_DCXS	L03	Categorical of period_number	period_number = 3	0.4684	0.00553	<.0001
mperiodnbr_DCXS	Z04	Categorical of period_number	base level: else			
vperiodnbr_DCXS_pw1		Variate piecewise of period_number	median(0,period_number-4,9-4)	-0.07	0.000703	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vperiodnbr_DCXS_pw2		Variate piecewise of period_number	median(0,period_number-9,17-9)	-0.00157	0.000336	<.0001
vperiodnbr_DCXS_pw3		Variate piecewise of period_number	median(0,period_number-17,30-17)	0.0159	0.000217	<.0001
vperiodnbr_DCXS_pw4		Variate piecewise of period_number	median(0,period_number-30,38-30)	0.00886	0.000356	<.0001
vperiodnbr_DCXS_pw5		Variate piecewise of period_number	median(0,period_number-38,57-38)	0.00907	0.000213	<.0001
vperiodnbr_DCXS_pw6		Variate piecewise of period_number	median(0,period_number-57,85-57)	0.00259	0.000223	<.0001
vperiodnbr_DCXS_pw7		Variate piecewise of period_number	median(0,period_number-85,105-85)	-0.0093	0.000704	<.0001
mcredit_DCXS	L01	Categorical of credit_score	credit_score = 0	0.1502	0.00354	<.0001
mcredit_DCXS	Z00	Categorical of credit_score	base level: else			
vcredit_DCXS_pw1		Variate piecewise of credit_score	median(0,credit_score-500,625-500)	0.00315	0.000032	<.0001
vcredit_DCXS_pw2		Variate piecewise of credit_score	median(0,credit_score-625,680-625)	0.00346	0.000042	<.0001
vcredit_DCXS_pw3		Variate piecewise of credit_score	median(0,credit_score-680,780-680)	0.000399	0.000044	<.0001
mdurdefepi_DCXS	Z01	Categorical of dur_def_episode (duration of default episode)	base level: dur_def_episode <=1			
mdurdefepi_DCXS	L02	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 2	-0.6065	0.0014	<.0001
mdurdefepi_DCXS	L03	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 3	-0.9723	0.00178	<.0001
mdurdefepi_DCXS	L04	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 4	-1.3375	0.00231	<.0001
mdurdefepi_DCXS	L05	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 5	-1.5469	0.00282	<.0001
mdurdefepi_DCXS	L06	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 6	-1.7624	0.00343	<.0001
mdurdefepi_DCXS	L07	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 7	-1.9562	0.00414	<.0001
mdurdefepi_DCXS	L08	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 8	-2.1354	0.00495	<.0001
mdurdefepi_DCXS	L09	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 9	-2.2468	0.00566	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mdurdefepi_DCXS	L10	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 10	-2.391	0.00652	<.0001
mdurdefepi_DCXS	L11	Categorical of dur_def_episode (duration of default episode)	else	-2.5275	0.00715	<.0001
vdurdefepi_DCXS_pw1		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-10,16-10)	-0.0171	0.00173	<.0001
vdurdefepi_DCXS_pw2		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-16,30-16)	-0.00889	0.00074	<.0001
vdeltaUEInit_DCXS_pw1		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-0,60-0)	0.00313	0.000154	<.0001
vdeltaUEInit_DCXS_pw2		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-60,100-60)	-0.00349	0.000066	<.0001
vdeltaUEInit_DCXS_pw3		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-100,116-100)	-0.00827	0.00014	<.0001
vdeltaUEInit_DCXS_pw4		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-116,218-116)	-0.00189	0.000032	<.0001
vdeltaUEInit_DCXS_pw5		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-218,330-218)	-0.00042	0.000063	<.0001
mRatioTmpTei_DCXS	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	-0.4107	0.00589	<.0001
mRatioTmpTei_DCXS	Z00	Categorical of ratio_tmp_tei (front-end ratio)	base level: else			

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vratiotmptei_DCXS_pw1		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,24-0)	-0.0166	0.000172	<.0001
vratiotmptei_DCXS_pw2		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-24,36-24)	-0.0115	0.000167	<.0001
vratiotmptei_DCXS_pw3		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-36,50-36)	-0.00542	0.000345	<.0001
mpriordef_DCXS	L01	Categorical of prior_default_cnt	prior_default_cnt = 1	-0.1197	0.00157	<.0001
mpriordef_DCXS	L02	Categorical of prior_default_cnt	prior_default_cnt > 1	-0.1664	0.0018	<.0001
mpriordef_DCXS	Z00	Categorical of prior_default_cnt	base: prior_default_cnt = 0			
vpriordef_DCXS_pw1		Variate of prior_default_cnt	median(0,prior_default_cnt-1,22-1)	0.00551	0.000374	<.0001
vdeltaUEpr3_DCXS_pw1		Variate piecewise of deltaueprr3_r[5] (change in unemployment from 3 quarters prior)	median(0,delta_ue_sa_st_r-(-20),-30-(-20))	0.00294	0.000176	<.0001
vdeltaUEpr3_DCXS_pw2		Variate piecewise of deltaueprr3_r[5] (change in unemployment from 3 quarters prior)	median(0,delta_ue_sa_st_r-(-20),10-(-20))	-0.00119	0.00007	<.0001
vUEblend_DCXS_pw1		Variate piecewise of ue_blended_r[8] (unemployment rate)	median(0,ue_blended_r-200,480-200)	-0.00075	0.000013	<.0001
vUEblend_DCXS_pw2		Variate piecewise of ue_blended_r[8] (unemployment rate)	median(0,ue_blended_r-480,800-480)	-0.00054	7.39E-06	<.0001
vltv_DCXS_pw1		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-0,71-0)	-0.00413	0.000167	<.0001
vltv_DCXS_pw2		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-71,81-71)	-0.00982	0.000213	<.0001
vltv_DCXS_pw3		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-81,85-81)	-0.00481	0.000355	<.0001
vltv_DCXS_pw4		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-85,92-85)	-0.05	0.000917	<.0001
vltv_DCXS_pw5		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-92,95-92)	-0.1622	0.00201	<.0001
vloanraw_DCXS_pw1		Variate piecewise of loansize_raw	median(0,loansize_raw-27000,70000-27000)	3.27E-07	8.86E-08	0.0002
vloanraw_DCXS_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-70000,98000-70000)	-1.13E-06	7.51E-08	<.0001
vloanraw_DCXS_pw3		Variate piecewise of loansize_raw	median(0,loansize_raw-98000,180000-98000)	-5.80E-07	2.57E-08	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vloanraw_DCXS_pw4		Variate piecewise of loansize_raw	median(0,loansize_raw-180000,500000-180000)	-3.56E-07	1.56E-08	<.0001
mDeltaTY10_DCXS	L01	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r^2< 53	-0.0485	0.00183	<.0001
mDeltaTY10_DCXS	L02	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r^2 > 112	0.1535	0.00198	<.0001
mDeltaTY10_DCXS	Z00	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	base level: else			
mDeltaTm3_DCXS	L01	Categorical of DeltaTm3Init_r^{12} (change in 3 month treasury from policy inception to current)	DeltaTm3Init_r^{12} > 1000	0.129	0.0023	<.0001
mDeltaTm3_DCXS	Z00	Categorical of DeltaTm3Init_r^{12} (change in 3 month treasury from policy inception to current)	base level: else			
mTY30_DCXS	L01	Categorical of treasury_yr_30	treasury_yr_30>6	-0.1476	0.0055	<.0001
mTY30_DCXS	Z00	Categorical of treasury_yr_31	base level: else			
mcalperiod_DCXS	L01	Categorical of Calendar Period	period < 200102	-0.6177	0.00416	<.0001
mcalperiod_DCXS	z	Categorical of Calendar Period	base level: else			
vSBOI_DCXS_pw1		Variate piecewise of SBOI (small business optimism index)	median(0,mSBOI-85,100-85)	-0.0338	0.000243	<.0001
vSBOI_DCXS_pw2		Variate piecewise of SBOI (small business optimism index)	median(0,mSBOI-100,108-100)	0.00997	0.000402	<.0001

Default Transition Model Parameters – FRM30NSR D_END

The model parameters for the FRM30NSR default to end (prepayment or refinance) transition are shown below.

Table 48: Default to End Transition FRM30NSR Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				-1.3141	0.0591	<.0001
mseason	1	Categorical of season	season = "winter"	-0.1416	0.00502	<.0001
mseason	2	Categorical of season	season = "spring"	0.0783	0.0049	<.0001
mseason	3	Categorical of season	season = "summer"	0.1011	0.00493	<.0001
mseason	4	Categorical of season	base level: season = "fall"			
mjudicial	1	Categorical of judicial (judicial state)	judicial = 1 (yes)	-0.1979	0.00364	<.0001
mjudicial	2	Categorical of judicial (judicial state)	base level: else			
mdpa	1	Categorical of dpa (down payment assistance)	dpa = "govt"	-0.2333	0.0133	<.0001
mdpa	2	Categorical of dpa (down payment assistance)	dpa = "nonprof"	-0.3917	0.00794	<.0001
mdpa	3	Categorical of dpa (down payment assistance)	dpa = "relative"	0.0621	0.00473	<.0001
mdpa	4	Categorical of dpa (down payment assistance)	base level: dpa = "na_other"			
mfrst_tm_by	1	Categorical of frst_tm_by (first-time buyer)	frst_tm_by = "Y"	-0.0761	0.0042	<.0001
mfrst_tm_by	2	Categorical of frst_tm_by (first-time buyer)	base level: else			
mycslope_DEND	L01	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r<=111	0.1746	0.00576	<.0001
mycslope_DEND	L02	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r>=875	-0.6331	0.00798	<.0001
mycslope_DEND	L03	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r>=2000	-0.7775	0.0092	<.0001
mycslope_DEND	Z00	Categorical of ycslope_r[9] (yield curve slope)	base level: else			
mhpa2yb_DEND	L085	Categorical of hpa2y_blended_r[6]	hpa2y_blended_r <= 80	0.0724	0.0226	0.0014
mhpa2yb_DEND	Z00	Categorical of hpa2y_blended_r[6]	base level: else			
vhpa2yb_DEND_pw1		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-80,105-80)	0.0182	0.000705	<.0001
vhpa2yb_DEND_pw2		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-105,120-105)	0.0633	0.000408	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vhpa2yb_DEND_pw3		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-120,180-120)	0.0399	0.000313	<.0001
mperiodnbr_DEND	L02	Categorical of period_number	period_number = 2	0.2213	0.0503	<.0001
mperiodnbr_DEND	L03	Categorical of period_number	period_number = 3	-0.0268	0.0222	0.2278
mperiodnbr_DEND	L04	Categorical of period_number	period_number = 4	-0.1572	0.0166	<.0001
mperiodnbr_DEND	L05	Categorical of period_number	period_number = 5	-0.1655	0.0143	<.0001
mperiodnbr_DEND	L06	Categorical of period_number	period_number = 6	-0.1749	0.013	<.0001
mperiodnbr_DEND	L07	Categorical of period_number	period_number = 7	-0.1979	0.0121	<.0001
mperiodnbr_DEND	L08	Categorical of period_number	period_number = 8	-0.1994	0.0117	<.0001
mperiodnbr_DEND	L09	Categorical of period_number	period_number = 9	-0.1063	0.011	<.0001
mperiodnbr_DEND	Z10	Categorical of period_number	base level: else			
vperiodnbr_DEND_pw1		Variate piecewise of period_number	median(0,period_number-10,65-10)	0.00847	0.000251	<.0001
vperiodnbr_DEND_pw2		Variate piecewise of period_number	median(0,period_number-65,90-65)	0.00561	0.000991	<.0001
vperiodnbr_DEND_pw3		Variate piecewise of period_number	median(0,period_number-90,114-90)	0.00906	0.00274	0.0009
mcredit_DEND	L01	Categorical of credit_score	credit_score = 0	0.4273	0.0244	<.0001
mcredit_DEND	Z00	Categorical of credit_score	base level: else			
vcredit_DEND_pw1		Variate piecewise of credit_score	median(0,credit_score-450,600-450)	0.000286	0.000178	0.1091
vcredit_DEND_pw2		Variate piecewise of credit_score	median(0,credit_score-600,680-600)	0.0047	0.000117	<.0001
vcredit_DEND_pw3		Variate piecewise of credit_score	median(0,credit_score-680,780-680)	0.00372	0.000137	<.0001
mdurdefepi_DEND	Z01	Categorical of dur_def_episode (duration of default episode)	base level: dur_def_episode <=1			
mdurdefepi_DEND	L02	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 2	-0.5016	0.00507	<.0001
mdurdefepi_DEND	L03	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 3	-0.7054	0.00617	<.0001
mdurdefepi_DEND	L04	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 4	-0.8659	0.00736	<.0001
mdurdefepi_DEND	L05	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 5	-0.9734	0.00858	<.0001
mdurdefepi_DEND	L06	Categorical of dur_def_episode	dur_def_episode = 6	-1.0586	0.00974	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		(duration of default episode)				
mdurdefepi_DEND	L07	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 7	-1.157	0.011	<.0001
mdurdefepi_DEND	L08	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 8	-1.1948	0.0121	<.0001
mdurdefepi_DEND	L09	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 9	-1.2571	0.0134	<.0001
mdurdefepi_DEND	L10	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 10	-1.2472	0.0142	<.0001
mdurdefepi_DEND	L11	Categorical of dur_def_episode (duration of default episode)	dur_def_episode >10	-1.32	0.00942	<.0001
vdurdefepi_DEND_pw1		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-10,30-10)	0.00432	0.000995	<.0001
vdurdefepi_DEND_pw2		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-30,40-30)	-0.0351	0.00326	<.0001
vdeltaUEInit_DEND_pw1		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-0,63-0)	-0.00712	0.000367	<.0001
vdeltaUEInit_DEND_pw2		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-63,100-63)	-0.00146	0.000215	<.0001
vdeltaUEInit_DEND_pw3		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-100,116-100)	0.006	0.000454	<.0001
vdeltaUEInit_DEND_pw4		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy	median(0,DeltaUEInit_r-116,200-116)	-0.0019	0.000126	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		inception to current)				
mRatioTmpTei_DEND	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	-0.5502	0.0278	<.0001
mRatioTmpTei_DEND	Z00	Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_DEND_pw1		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,15-0)	-0.0346	0.00184	<.0001
vratiotmptei_DEND_pw2		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-15,24-15)	-0.00955	0.000759	<.0001
vratiotmptei_DEND_pw3		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-24,50-24)	-0.00361	0.000376	<.0001
mpriordef_DEND	Z00	Categorical of prior_default_cnt	base level: prior_default_cnt = 0			
mpriordef_DEND	L01	Categorical of prior_default_cnt	prior_default_cnt = 1	-0.305	0.00473	<.0001
mpriordef_DEND	L02	Categorical of prior_default_cnt	prior_default_cnt = 2	-0.5175	0.0062	<.0001
mpriordef_DEND	L03	Categorical of prior_default_cnt	prior_default_cnt = 3	-0.6852	0.00779	<.0001
mpriordef_DEND	L04	Categorical of prior_default_cnt	prior_default_cnt = 4	-0.8266	0.00955	<.0001
mpriordef_DEND	L05	Categorical of prior_default_cnt	prior_default_cnt = 5	-0.9723	0.0117	<.0001
mpriordef_DEND	L06	Categorical of prior_default_cnt	prior_default_cnt = 6	-1.0592	0.0138	<.0001
mpriordef_DEND	L07	Categorical of prior_default_cnt	prior_default_cnt = 7	-1.1349	0.0164	<.0001
mpriordef_DEND	L08	Categorical of prior_default_cnt	prior_default_cnt = 8	-1.2071	0.0196	<.0001
mpriordef_DEND	L09	Categorical of prior_default_cnt	prior_default_cnt = 9	-1.3024	0.0239	<.0001
mpriordef_DEND	L10	Categorical of prior_default_cnt	prior_default_cnt >= 10	-1.4148	0.0186	<.0001
vsato_DEND_pw1		Variate piecewise of sato (spread at origination)	median(sato-(-.4),0,.95-(-.4))	0.038	0.00457	<.0001
vsato_DEND_pw2		Variate piecewise of sato (spread at origination)	median(sato-.95,0,1.82-.95)	0.1034	0.017	<.0001
vdeltaUEpr3_DEND_pw1		Variate piecewise of deltauepr3_r[5] (change in unemployment from 3 quarters prior)	median(0,delta_ue_sa_st_r-(-20),-30-(-20))	0.000907	0.00057	0.1117
vdeltaUEpr3_DEND_pw2		Variate piecewise of deltauepr3_r[5] (change in unemployment from 3 quarters prior)	median(0,delta_ue_sa_st_r-(-20),10-(-20))	0.00513	0.00022	<.0001
vUEblend_DEND_pw1		Variate piecewise of ue_blended_r[8]	median(0,ue_blended_r-0,450-0)	-0.00153	0.000045	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		(unemployment rate)				
vUEblend_DEND_pw2		Variate piecewise of ue_blended_r[8] (unemployment rate)	median(0,ue_blended_r-450,850-450)	-0.00056	0.000022	<.0001
vUEblend_DEND_pw3		Variate piecewise of ue_blended_r[8] (unemployment rate)	median(0,ue_blended_r-850,1500-850)	-0.00034	0.00003	<.0001
vltv_DEND_pw1		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-0,55-0)	-0.00793	0.000735	<.0001
vltv_DEND_pw2		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-55,74-55)	-0.0247	0.000816	<.0001
vltv_DEND_pw3		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-74,84-74)	0.00415	0.000917	<.0001
vltv_DEND_pw4		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-84,90-84)	-0.0199	0.00124	<.0001
vltv_DEND_pw5		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-90,94-90)	-0.0565	0.0019	<.0001
vltv_DEND_pw6		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-94,99-94)	-0.1544	0.00441	<.0001
vloanraw_DEND_pw1		Variate piecewise of loansize_raw	median(0,loansize_raw-30000,70000-30000)	3.26E-06	2.85E-07	<.0001
vloanraw_DEND_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-70000,98000-70000)	5.20E-06	2.44E-07	<.0001
vloanraw_DEND_pw3		Variate piecewise of loansize_raw	median(0,loansize_raw-98000,180000-98000)	2.80E-06	8.57E-08	<.0001
vloanraw_DEND_pw4		Variate piecewise of loansize_raw	median(0,loansize_raw-180000,500000-180000)	8.07E-07	4.85E-08	<.0001
mDeltaTY10_DEND	L01	Categorical of DeltaTy10Init_r[2] (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r < 53	-0.2375	0.00736	<.0001
mDeltaTY10_DEND	Z00	Categorical of DeltaTy10Init_r[2] (change in 10-year Treasury rate from policy inception to current)	base level: else			
mprior3_ue_DEND	L01	Categorical of prior3_ue_r[11] (state unemployment 3 prior quarters)	prior3_ue_r[11]<1400	0.282	0.0304	<.0001
mprior3_ue_DEND	Z00	Categorical of prior3_ue_r[11] (state unemployment 3 prior quarters)	base level: else			

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mcalperiod_DEND	L01	Categorical of Calendar Period	period < 200201	-0.3575	0.00931	<.0001
mcalperiod_DEND	z	Categorical of Calendar Period	base level: else			
vSBOI_DEND_pw1		Variate piecewise of SBOI (small business optimism index)	median(0,mSBOI-85,100-85)	0.00418	0.00118	0.0004
vSBOI_DEND_pw2		Variate piecewise of SBOI (small business optimism index)	median(0,mSBOI-100,108-100)	0.035	0.0014	<.0001
vCCI_DEND_pw1		Variate piecewise of SBOI (small business optimism index)	median(0,mCCI-25,100-25)	-0.00346	0.000275	<.0001
vCCI_DEND_pw2		Variate piecewise of SBOI (small business optimism index)	median(0,mCCI-100,142-100)	-0.0125	0.000307	<.0001

Default Transition Model Parameters – FRM30SR D_CLM

The model parameters for the FRM30SR default to claim transition are shown below.

Table 49: Default to Claim Transition FRM30SR Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				-3.4866	0.0767	<.0001
mseason_grp_DCLM	L02	Categorical of season	mseason = 2	0.0528	0.0063	<.0001
mseason_grp_DCLM	L03	Categorical of season	mseason = 3	0.0503	0.00637	<.0001
mseason_grp_DCLM	Z0104	Categorical of season	mseason in(1,4)			
mjudicial	1	Categorical of judicial (judicial state)	judicial = 1 (yes)	-0.2493	0.00556	<.0001
mjudicial	2	Categorical of judicial (judicial state)	base level: else			
mcalperiod_DCLM	L199704	Categorical of Calendar Period	period < 199704	1.1732	0.0187	<.0001
mcalperiod_DCLM	L200104	Categorical of Calendar Period	period < 200104	0.6824	0.0155	<.0001
mcalperiod_DCLM	L200604	Categorical of Calendar Period	period < 200604	0.1167	0.012	<.0001
mcalperiod_DCLM	Z	Categorical of Calendar Period	base level: else			
mycslope_DCLM	L01	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r<=141	-0.1641	0.00935	<.0001
mycslope_DCLM	Z00	Categorical of ycslope_r[9] (yield curve slope)	base level: else			

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vycslope_DCLM_pw1		Variate of ycslope_r^9 (yield curve slope)	median(0,ycslope_r-141,478-141)	-0.00012	0.000012	<.0001
vycslope_DCLM_pw2		Variate of ycslope_r^9 (yield curve slope)	median(0,ycslope_r-478,1270-478)	0.000145	0.00001	<.0001
vhpa2yb_DCLM_pw1		Variate piecewise of hpa2y_blended_r^6	median(0,hpa2y_blended_r-45,85-45)	-0.0137	0.0013	<.0001
vhpa2yb_DCLM_pw2		Variate piecewise of hpa2y_blended_r^6	median(0,hpa2y_blended_r-85,100-85)	0.0254	0.00097	<.0001
vhpa2yb_DCLM_pw3		Variate piecewise of hpa2y_blended_r^6	median(0,hpa2y_blended_r-100,138-100)	-0.00361	0.000426	<.0001
vhpa2yb_DCLM_pw4		Variate piecewise of hpa2y_blended_r^6	median(0,hpa2y_blended_r-138,160-138)	-0.0407	0.00322	<.0001
mperiodnbr_DCLM	L02	Categorical of period_number	period_number <= 2	-0.6751	0.1873	0.0003
mperiodnbr_DCLM	L03	Categorical of period_number	period_number = 3	-0.3753	0.0602	<.0001
mperiodnbr_DCLM	L04	Categorical of period_number	period_number = 4	-0.1258	0.0338	0.0002
mperiodnbr_DCLM	L05	Categorical of period_number	period_number = 5	0.0968	0.0232	<.0001
mperiodnbr_DCLM	L06	Categorical of period_number	period_number = 6	0.1157	0.0193	<.0001
mperiodnbr_DCLM	L07	Categorical of period_number	period_number = 7	0.1219	0.0173	<.0001
mperiodnbr_DCLM	L08	Categorical of period_number	period_number = 8	0.0936	0.0163	<.0001
mperiodnbr_DCLM	Z00	Categorical of period_number	base level: else			
vperiodnbr_DCLM_pw1		Variate piecewise of period_number	median(0,period_number-9,17-9)	0.0123	0.00145	<.0001
vperiodnbr_DCLM_pw2		Variate piecewise of period_number	median(0,period_number-17,59-17)	0.0033	0.00043	<.0001
vperiodnbr_DCLM_pw3		Variate piecewise of period_number	median(0,period_number-59,86-59)	-0.0126	0.00195	<.0001
vcredit_DCLM_pw1		Variate piecewise of credit_score	median(0,credit_score-550,635-550)	-0.00108	0.000175	<.0001
vcredit_DCLM_pw2		Variate piecewise of credit_score	median(0,credit_score-635,780-635)	0.00478	0.000239	<.0001
mdurdefepi_DCLM	Z01	Categorical of dur_def_episode (duration of default episode)	base level: dur_def_episode <= 1			
mdurdefepi_DCLM	L02	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 2	0.6767	0.0115	<.0001
mdurdefepi_DCLM	L03	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 3	1.1759	0.0112	<.0001
mdurdefepi_DCLM	L04	Categorical of dur_def_episode	dur_def_episode = 4	1.4151	0.0115	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		(duration of default episode)				
mdurdefepi_DCLM	L05	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 5	1.5096	0.012	<.0001
mdurdefepi_DCLM	L06	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 6	1.4941	0.0129	<.0001
mdurdefepi_DCLM	L07	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 7	1.4874	0.0137	<.0001
mdurdefepi_DCLM	L08	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 8	1.4251	0.0148	<.0001
mdurdefepi_DCLM	L09	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 9	1.4233	0.0157	<.0001
mdurdefepi_DCLM	L10	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 10	1.403	0.0168	<.0001
mdurdefepi_DCLM	L11	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 11	1.3681	0.0181	<.0001
mdurdefepi_DCLM	L12	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 12	1.3254	0.0195	<.0001
mdurdefepi_DCLM	L13	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 13	1.3649	0.0205	<.0001
mdurdefepi_DCLM	L14	Categorical of dur_def_episode (duration of default episode)	else	1.3017	0.0157	<.0001
vdurdefepi_DCLM_pw1		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-13,40-13)	-0.0104	0.00157	<.0001
vdurdefepi_DCLM_pw2		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-40,50-40)	-0.1791	0.0195	<.0001
vdeltaUEinit_DCLM_pw1		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-0,53-0)	-0.0153	0.00106	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vdeltaUEinit_DCLM_pw2		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-53,98-53)	-0.011	0.000247	<.0001
vdeltaUEinit_DCLM_pw3		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-98,330-98)	0.00104	0.000106	<.0001
vratiotmptei_DCLM_pw1		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,24-0)	0.00406	0.00035	<.0001
mpriordef_DCLM	Z00	Categorical of prior_default_cnt	base level: prior_default_cnt = 0			
mpriordef_DCLM	L01	Categorical of prior_default_cnt	prior_default_cnt = 1	-0.3952	0.00703	<.0001
mpriordef_DCLM	L02	Categorical of prior_default_cnt	prior_default_cnt = 2	-0.5871	0.00953	<.0001
mpriordef_DCLM	L03	Categorical of prior_default_cnt	prior_default_cnt = 3	-0.7458	0.0124	<.0001
mpriordef_DCLM	L04	Categorical of prior_default_cnt	prior_default_cnt = 4	-0.8891	0.0159	<.0001
mpriordef_DCLM	L05	Categorical of prior_default_cnt	prior_default_cnt = 5	-0.99	0.0203	<.0001
mpriordef_DCLM	L06	Categorical of prior_default_cnt	prior_default_cnt = 6	-1.1624	0.0273	<.0001
mpriordef_DCLM	L07	Categorical of prior_default_cnt	prior_default_cnt = 7	-1.2482	0.036	<.0001
mpriordef_DCLM	L08	Categorical of prior_default_cnt	prior_default_cnt = 8	-1.3963	0.0483	<.0001
mpriordef_DCLM	L09	Categorical of prior_default_cnt	else	-1.2198	0.0781	<.0001
vpriordef_DCLM_pw1		Variate of prior_default_cnt	median(0,prior_default_cnt-8,15-8)	-0.141	0.0324	<.0001
vdeltaUEpr3_DCLM_pw1		Variate piecewise of deltaueprr3_r^5 (change in unemployment from 3 quarters prior)	median(0,delta_ue_sa_st_r-(-20),-30-(-20))	-0.00273	0.000834	0.001
vdeltaUEpr3_DCLM_pw2		Variate piecewise of deltaueprr3_r^5 (change in unemployment from 3 quarters prior)	median(0,delta_ue_sa_st_r-(-20),10-(-20))	-0.00468	0.00035	<.0001
vUEblend_DCLM_pw1		Variate piecewise of ue_blended_r^8 (unemployment rate)	median(0,ue_blended_r-200,550-200)	0.00255	0.000053	<.0001
vUEblend_DCLM_pw2		Variate piecewise of ue_blended_r^8 (unemployment rate)	median(0,ue_blended_r-550,850-550)	-0.00047	0.000037	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vUEblend_DCLM_pw3		Variate piecewise of ue_blended_r[8] (unemployment rate)	median(0,ue_blended_r-850,1500-850)	0.000293	0.000033	<.0001
vltv_DCLM_pw1		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-40,70-40)	0.00226	0.000543	<.0001
vltv_DCLM_pw2		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-70,81-70)	0.0246	0.00132	<.0001
vltv_DCLM_pw3		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-81,92-81)	0.00728	0.00097	<.0001
vltv_DCLM_pw4		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-92,100-92)	0.0367	0.00294	<.0001
vloanraw_DCLM_pw1		Variate piecewise of loansize_raw	median(0,loansize_raw-60000,100000-60000)	6.12E-06	2.64E-07	<.0001
vloanraw_DCLM_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-100000,200000-100000)	-7.54E-07	9.65E-08	<.0001
vloanraw_DCLM_pw3		Variate piecewise of loansize_raw	median(0,loansize_raw-200000,500000-200000)	-1.52E-06	7.45E-08	<.0001
mTY30_DCLM	L07	Categorical of treasury_yr_30	treasury_yr_30 > 7	0.4774	0.0343	<.0001
mTY30_DCLM	Z00	Categorical of treasury_yr_30	base level: else			

Default Transition Model Parameters – FRM30SR D_CXM

The model parameters for the FRM30SR default to modified cure transition are shown below.

Table 50: Default to Modified Cure Transition FRM30SR Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				-6.398	0.0955	<.0001
mcalperiod_DCXM	L200604	Categorical of Calendar Period	period < 200604	-6.1491	0.1385	<.0001
mcalperiod_DCXM	Z	Categorical of Calendar Period	base level: else			
mseason	1	Categorical of season	season = "winter"	-0.03	0.0079	0.0001
mseason	2	Categorical of season	season = "spring"	0.117	0.00771	<.0001
mseason	3	Categorical of season	season = "summer"	0.086	0.0078	<.0001
mseason	4	Categorical of season	base level: season = "fall"			
mjudicial	1	Categorical of judicial (judicial state)	judicial = 1 (yes)	-0.0824	0.00598	<.0001
mjudicial	2	Categorical of judicial (judicial state)	base level: else			
vhpa2yb_DCXM_pw1		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-65,83-65)	0.016	0.00194	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vhpa2yb_DCXM_pw2		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-83,94-83)	-0.00832	0.00145	<.0001
vhpa2yb_DCXM_pw3		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-94,115-94)	0.00689	0.000629	<.0001
vhpa2yb_DCXM_pw4		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-115,140-115	0.0078	0.00101	<.0001
mperiodnbr_DCXM	L02	Categorical of period_number	period_number <= 2	-1.038	0.2383	<.0001
mperiodnbr_DCXM	L03	Categorical of period_number	period_number = 3	-0.5827	0.0864	<.0001
mperiodnbr_DCXM	L04	Categorical of period_number	period_number = 4	-0.3524	0.0569	<.0001
mperiodnbr_DCXM	Z00	Categorical of period_number	base level: else			
vperiodnbr_DCXM_pw1		Variate piecewise of period_number	median(0,period_number-4,8-4)	0.233	0.00859	<.0001
vperiodnbr_DCXM_pw2		Variate piecewise of period_number	median(0,period_number-8,12-8)	-0.0625	0.00372	<.0001
vperiodnbr_DCXM_pw3		Variate piecewise of period_number	median(0,period_number-12,21-12)	0.026	0.00132	<.0001
vperiodnbr_DCXM_pw4		Variate piecewise of period_number	median(0,period_number-21,59-21)	-0.00427	0.000473	<.0001
mdurdefepi_DCXM	Z01	Categorical of dur_def_episode (duration of default episode)	base level: dur_def_episode <=1			
mdurdefepi_DCXM	L02	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 2	0.4806	0.00862	<.0001
mdurdefepi_DCXM	L03	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 3	0.5689	0.00923	<.0001
mdurdefepi_DCXM	L04	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 4	0.5301	0.0102	<.0001
mdurdefepi_DCXM	L05	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 5	0.4268	0.0115	<.0001
mdurdefepi_DCXM	L06	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 6	0.3425	0.013	<.0001
mdurdefepi_DCXM	L07	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 7	0.2034	0.015	<.0001
mdurdefepi_DCXM	L08	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 8	0.0729	0.014	<.0001
vdurdefepi_DCXM_pw1		Variate piecewise of	median(0,dur_def_episode-7,23-7)	-0.079	0.00215	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		dur_def_episode (duration of default episode)				
vdurdefepi_DCXM_pw2		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-23,40-23)	0.0258	0.00519	<.0001
vdeltaUEinit_DCXM_pw1		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-0,66-0)	0.00702	0.00057	<.0001
vdeltaUEinit_DCXM_pw2		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-66,90-66)			
vdeltaUEinit_DCXM_pw3		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-90,131-90)	0.00541	0.000277	<.0001
vdeltaUEinit_DCXM_pw4		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-131,200-131	0.00256	0.000196	<.0001
mRatioTmpTei_DCXM	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	0.482	0.0444	<.0001
mRatioTmpTei_DCXM	Z01	Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_DCXM_pw1		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,24-0)	0.0232	0.0022	<.0001
vratiotmptei_DCXM_pw2		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-24,36-24)	0.0108	0.00199	<.0001
vratiotmptei_DCXM_pw3		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-36,100-36)	-0.00468	0.000919	<.0001
mpriordef_DCXM	Z00	Categorical of prior_default_cnt	base level: prior_default_cnt = 0			
mpriordef_DCXM	L01	Categorical of prior_default_cnt	prior_default_cnt = 1	0.197	0.00786	<.0001
mpriordef_DCXM	L02	Categorical of prior_default_cnt	prior_default_cnt = 2	0.2583	0.00915	<.0001
mpriordef_DCXM	L03	Categorical of prior_default_cnt	prior_default_cnt = 3	0.278	0.0107	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mpriordef_DCXM	L04	Categorical of prior_default_cnt	prior_default_cnt = 4	0.2847	0.0125	<.0001
mpriordef_DCXM	L05	Categorical of prior_default_cnt	prior_default_cnt >= 5	0.2608	0.0136	<.0001
vpriordef_DCXM_pw1		Variate pf prior_default_cnt	median(0,prior_default_cnt-5,9-5)	-0.024	0.0063	0.0001
vpriordef_DCXM_pw2		Variate pf prior_default_cnt	median(0,prior_default_cnt-9,14-9)	-0.0803	0.0131	<.0001
vsato_DCXM_pw1		Variate piecewise of sato (spread at origination)	median(sato-(-1.4),0,.6-(-1.4))	0.0219	0.00821	0.0076
vsato_DCXM_pw2		Variate piecewise of sato (spread at origination)	max(sato-.6,0)	0.1031	0.0281	0.0002
vUEblend_DCXM_pw1		Variate piecewise of ue_blended_r^{8} (change in unemployment rate)	median(0,ue_blended_r-200,420-200)	0.000877	0.000122	<.0001
vUEblend_DCXM_pw2		Variate piecewise of ue_blended_r^{8} (change in unemployment rate)	median(0,ue_blended_r-420,940-420)	-0.00062	0.000025	<.0001
vUEblend_DCXM_pw3		Variate piecewise of ue_blended_r^{8} (change in unemployment rate)	median(0,ue_blended_r-940,1500-940)	-0.00011	0.000042	0.0099
vltv_DCXM_pw1		Variate piecewise of ltv_i_r^{7} (loan-to-value)	median(0,ltv_i_r-48,82-48)	0.00295	0.000498	<.0001
vltv_DCXM_pw2		Variate piecewise of ltv_i_r^{7} (loan-to-value)	median(0,ltv_i_r-82,91-82)	0.0116	0.00103	<.0001
vloanraw_DCXM_pw1		Variate piecewise of loansize_raw	median(0,loansize_raw-0,70000-0)	0.00001	8.92E-07	<.0001
vloanraw_DCXM_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-70000,120000-70000)	4.23E-06	2.18E-07	<.0001
vloanraw_DCXM_pw3		Variate piecewise of loansize_raw	median(0,loansize_raw-120000,400000-120000)	5.81E-07	4.74E-08	<.0001
mDeltaTY10_DCXM	L01	Categorical of DeltaTy10Init_r^{2} (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r < 53	-0.2023	0.00848	<.0001
mDeltaTY10_DCXM	Z00	Categorical of DeltaTy10Init_r^{2} (change in 10-year Treasury rate from policy inception to current)	base level: else			
mDeltaTM3_DCXM	L01	Categorical of DeltaTm3Init_r^{12} (change in 3 month treasury from policy	DeltaTM3Init_r < 3	-0.109	0.0101	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		inception to current)				
mDeltaTM3_DCXM	L02	Categorical of DeltaTm3Init_r[12] (change in 3 month treasury from policy inception to current)	DeltaTM3Init_r > 550	-0.2632	0.011	<.0001
mDeltaTM3_DCXM	Z00	Categorical of DeltaTm3Init_r[12] (change in 3 month treasury from policy inception to current)	base level: else			

Default Transition Model Parameters – FRM30SR D_CXS

The model parameters for the FRM30SR default to self-cure transition are shown below.

Table 51: Default to Self-Cure Transition FRM30SR Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				0.3559	0.0254	<.0001
mcalperiod_DCXS	L200104	Categorical of Calendar Period	period < 200104	-1.2054	0.00848	<.0001
mcalperiod_DCXS	L200604	Categorical of Calendar Period	period < 200604	-0.7326	0.00636	<.0001
mcalperiod_DCXS	Z201800	Categorical of Calendar Period	base level: else			
mseason	1	Categorical of season	season = "winter"	0.1813	0.00362	<.0001
mseason	2	Categorical of season	season = "spring"	0.2532	0.00368	<.0001
mseason	3	Categorical of season	season = "summer"	0.1014	0.00379	<.0001
mseason	4	Categorical of season	base level: season = "fall"			
mjudicial	1	Categorical of judicial (judicial state)	judicial = 1 (yes)	-0.1124	0.0028	<.0001
mjudicial	2	Categorical of judicial (judicial state)	base level: else			
mhpa2yb_DCXS	L085	Categorical of hpa2y_blended_r[6]	hpa2y_blended_r <= 80	0.0511	0.0126	<.0001
mhpa2yb_DCXS	Z000	Categorical of hpa2y_blended_r[6]	base level: else			
vhpa2yb_DCXS_pw1		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-80,99-80)	0.00901	0.000535	<.0001
vhpa2yb_DCXS_pw2		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-99,105-99)	-0.00418	0.000962	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vhpa2yb_DCXS_pw3		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-105,116-105)	0.00959	0.000464	<.0001
vhpa2yb_DCXS_pw4		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-116,180-116)	0.00858	0.000392	<.0001
mperiodnbr_DCXS	L02	Categorical of period_number	period_number <= 2	1.4079	0.0237	<.0001
mperiodnbr_DCXS	L03	Categorical of period_number	period_number = 3	0.6352	0.0121	<.0001
mperiodnbr_DCXS	L04	Categorical of period_number	period_number = 4	0.2595	0.01	<.0001
mperiodnbr_DCXS	L05	Categorical of period_number	period_number = 5	0.0274	0.00929	0.0032
mperiodnbr_DCXS	Z06	Categorical of period_number	base level: else			
vperiodnbr_DCXS_pw1		Variate piecewise of period_number	median(0,period_number-5,15-5)	-0.0219	0.000726	<.0001
vperiodnbr_DCXS_pw2		Variate piecewise of period_number	median(0,period_number-15,25-15)	0.0115	0.000563	<.0001
vperiodnbr_DCXS_pw3		Variate piecewise of period_number	median(0,period_number-25,57-25)	-0.001	0.000245	<.0001
vperiodnbr_DCXS_pw4		Variate piecewise of period_number	median(0,period_number-57,85-57)	0.00592	0.000585	<.0001
vperiodnbr_DCXS_pw5		Variate piecewise of period_number	median(0,period_number-85,105-85)	-0.00778	0.00223	0.0005
vcredit_DCXS_pw1		Variate piecewise of credit_score	median(0,credit_score-480,675-480)	0.000057	0.00003	0.0573
mdurdefepi_DCXS	Z01	Categorical of dur_def_episode (duration of default episode)	base level:dur_def_episode <=1			
mdurdefepi_DCXS	L02	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 2	-0.6663	0.00341	<.0001
mdurdefepi_DCXS	L03	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 3	-1.0509	0.00439	<.0001
mdurdefepi_DCXS	L04	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 4	-1.4123	0.00569	<.0001
mdurdefepi_DCXS	L05	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 5	-1.6016	0.00693	<.0001
mdurdefepi_DCXS	L06	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 6	-1.8105	0.00846	<.0001
mdurdefepi_DCXS	L07	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 7	-2.0337	0.0104	<.0001
mdurdefepi_DCXS	L08	Categorical of dur_def_episode	dur_def_episode = 8	-2.1738	0.0123	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		(duration of default episode)				
mdurdefepi_DCXS	L09	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 9	-2.2996	0.0142	<.0001
mdurdefepi_DCXS	L10	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 10	-2.4124	0.0162	<.0001
mdurdefepi_DCXS	L11	Categorical of dur_def_episode (duration of default episode)	dur_def_episode >10	-2.4481	0.0219	<.0001
vdurdefepi_DCXS_pw1		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-10,14-10)	-0.0546	0.00714	<.0001
vdurdefepi_DCXS_pw2		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-14,35-14)	-0.00405	0.00153	0.0081
vdeltaUEinit_DCXS_pw1		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-0,59-0)	0.00297	0.00035	<.0001
vdeltaUEinit_DCXS_pw3		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-95,104-95)	-0.0081	0.000501	<.0001
vdeltaUEinit_DCXS_pw4		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-104,200-104)	-0.00092	0.000077	<.0001
mRatioTmpTei_DCXS	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	-0.1949	0.00904	<.0001
mRatioTmpTei_DCXS	Z01	Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_DCXS_pw1		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-10,24-10)	-0.0125	0.000872	<.0001
vratiotmptei_DCXS_pw2		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-24,46-24)	-0.00592	0.000611	<.0001
mpriordef_DCXS	Z00	Categorical of prior_default_cnt	base level: prior_default_cnt = 0			

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mpriordef_DCXS	L01	Categorical of prior_default_cnt	prior_default_cnt = 1	-0.0388	0.00376	<.0001
mpriordef_DCXS	L02	Categorical of prior_default_cnt	else	-0.0684	0.00374	<.0001
vsato_DCXS_pw1		Variate piecewise of sato (spread at origination)	min(0,sato-0)	-0.067	0.00712	<.0001
vsato_DCXS_pw2		Variate piecewise of sato (spread at origination)	median(sato-0,0,.6-0)	-0.0929	0.00718	<.0001
vsato_DCXS_pw3		Variate piecewise of sato (spread at origination)	median(sato-.6,0,1.82-.6)	-0.0861	0.0118	<.0001
vdeltaUEpr3_DCXS_pw1		Variate piecewise of deltaueprr3_r^5 (change in unemployment from 3 quarters prior)	min(0,delta_ue_sa_st_r-(-20))	0.00096	0.000063	<.0001
vdeltaUEpr3_DCXS_pw2		Variate piecewise of deltaueprr3_r^5 (change in unemployment from 3 quarters prior)	median(delta_ue_sa_st_r-(-20),0,10-(-20))	0.00183	0.000142	<.0001
vdeltaUEpr3_DCXS_pw3		Variate piecewise of deltaueprr3_r^5 (change in unemployment from 3 quarters prior)	max(delta_ue_sa_st_r-10,0)	-0.00053	0.000036	<.0001
vUEblend_DCXS_pw1		Variate piecewise of ue_blended_r^8 (unemployment rate)	median(0,ue_blended_r-200,473-200)	-0.00081	0.000034	<.0001
vUEblend_DCXS_pw2		Variate piecewise of ue_blended_r^8 (unemployment rate)	median(0,ue_blended_r-473,750-473)	-0.00064	0.000019	<.0001
vUEblend_DCXS_pw3		Variate piecewise of ue_blended_r^8 (unemployment rate)	median(0,ue_blended_r-750,1500-750)	-0.00033	0.000014	<.0001
vltv_DCXS_pw1		Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-69,85-69)	-0.00599	0.000333	<.0001
vltv_DCXS_pw2		Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-85,94-85)	-0.0189	0.000602	<.0001
vltv_DCXS_pw3		Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_r-94,99-94)	-0.0426	0.00247	<.0001
vloanraw_DCXS_pw1		Variate piecewise of loansize_raw	median(0,loansize_raw-27000,158000-27000)	-2.51E-06	4.73E-08	<.0001
vloanraw_DCXS_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-158000,520000-158000)	-4.62E-07	2.73E-08	<.0001
mDeltaTY10_DCXS	L01	Categorical of DeltaTy10Init_r^2 (change in 10-year	DeltaTy10Init_r > 127	0.1953	0.00523	<.0001

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		Treasury rate from policy inception to current)				
mDeltaTY10_DCXS	Z00	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	base level: else			
mDeltaTm3_DCXS	L01	Categorical of DeltaTm3Init_r^{12} (change in 3 month treasury from policy inception to current)	DeltaTm3Init_r > 1000	0.1421	0.00508	<.0001
mDeltaTm3_DCXS	Z00	Categorical of DeltaTm3Init_r^{12} (change in 3 month treasury from policy inception to current)	base level: else			

Default Transition Model Parameters – FRM30SR D_END

The model parameters for the FRM30SR default to end (prepayment or refinance) transition are shown below.

Table 52: Default to End Transition FRM30SR Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	WaldChiSq
Intercept				-3.0706	0.0912	1132.572
mseason_grp_DEND	L02	Categorical of season	mseason = 2	0.1694	0.0101	278.925
mseason_grp_DEND	L03	Categorical of season	mseason = 3	0.1933	0.0104	344.9985
mseason_grp_DEND	Z0104	Categorical of season	base level: mseason in(1,4)			
mjudicial	1	Categorical of judicial (judicial state)	judicial = 1 (yes)	-0.224	0.00927	584.4139
mjudicial	2	Categorical of judicial (judicial state)	base level: else			
mycslope_DEND	L01	Categorical of ycslope_r^9 (yield curve slope)	ycslope_r<=125	0.0973	0.0106	83.7665
mycslope_DEND	L02	Categorical of ycslope_r^9 (yield curve slope)	ycslope_r>=470	-0.5094	0.0154	1096.716
mycslope_DEND	L03	Categorical of ycslope_r^9 (yield curve slope)	ycslope_r>=2200	-0.9095	0.0233	1526.287
mycslope_DEND	Z00	Categorical of ycslope_r^9 (yield curve slope)	base level: else			

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	WaldChiSq
vhpa2yb_DEND_pw1		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-85,102-85)	0.0155	0.00192	65.3363
vhpa2yb_DEND_pw2		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-102,109-102)	0.0631	0.00294	460.0102
vhpa2yb_DEND_pw3		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-109,120-109)	0.0667	0.00137	2361.993
vhpa2yb_DEND_pw4		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-120,180-120)	0.0365	0.000717	2582.692
mperiodnbr_DEND	L02	Categorical of period_number	period_number = 2	0.4886	0.0951	26.4138
mperiodnbr_DEND	L03	Categorical of period_number	period_number = 3	0.3113	0.0431	52.0632
mperiodnbr_DEND	Z00	Categorical of period_number	base level: else			
vperiodnbr_DEND_pw1		Variate piecewise of period_number	median(0,period_number-3,14-3)	0.0347	0.00208	279.4752
vperiodnbr_DEND_pw2		Variate piecewise of period_number	median(0,period_number-14,32-14)	0.0131	0.000967	184.4227
vperiodnbr_DEND_pw3		Variate piecewise of period_number	median(0,period_number-32,57-32)	0.00528	0.000991	28.4333
vperiodnbr_DEND_pw4		Variate piecewise of period_number	median(0,period_number-57,110-57)	0.023	0.0013	310.5232
mcredit_score_DEND	L00	Categorical of credit_score	credit_score = 0	0.1337	0.0218	37.599
mcredit_score_DEND	Z00	Categorical of credit_score	base level: else			
vcredit_DEND_pw1		Variate piecewise of credit_score	median(0,credit_score-642,780-642)	0.00326	0.000458	50.7145
mdurdefepi_DEND	Z01	Categorical of dur_def_episode (duration of default episode)	base level: dur_def_episode <= 1			
mdurdefepi_DEND	L02	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 2	-0.5292	0.0119	1982.786
mdurdefepi_DEND	L03	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 3	-0.7665	0.0147	2711.437
mdurdefepi_DEND	L04	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 4	-0.9376	0.0178	2761.8
mdurdefepi_DEND	L05	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 5	-1.0234	0.0208	2414.956
mdurdefepi_DEND	L06	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 6	-1.1447	0.0242	2231.499
mdurdefepi_DEND	L09	Categorical of dur_def_episode	dur_def_episode <= 9	-1.3288	0.0189	4926.293

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	WaldChiSq
		(duration of default episode)				
mdurdefepi_DEND	L20	Categorical of dur_def_episode (duration of default episode)	dur_def_episode <= 20	-1.4717	0.0174	7148.197
mdurdefepi_DEND	L34	Categorical of dur_def_episode (duration of default episode)	dur_def_episode <= 34	-1.4921	0.031	2314.729
mdurdefepi_DEND	L60	Categorical of dur_def_episode (duration of default episode)	dur_def_episode <= 60	-2.0274	0.084	582.6866
mdurdefepi_DEND	L61	Categorical of dur_def_episode (duration of default episode)	else	-2.0213	0.2955	46.7915
vdeltaUEinit_DEND_pw1		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-50,98-50)	0.0076	0.000326	542.1933
mpriordef_DEND	Z00	Categorical of prior_default_cnt	base level: prior_default_cnt = 0			
mpriordef_DEND	L01	Categorical of prior_default_cnt	prior_default_cnt = 1	-0.334	0.0114	850.8756
mpriordef_DEND	L02	Categorical of prior_default_cnt	prior_default_cnt = 2	-0.5683	0.0153	1371.071
mpriordef_DEND	L03	Categorical of prior_default_cnt	prior_default_cnt = 3	-0.8023	0.0198	1637.028
mpriordef_DEND	L04	Categorical of prior_default_cnt	prior_default_cnt = 4	-0.976	0.0244	1603.311
mpriordef_DEND	L05	Categorical of prior_default_cnt	prior_default_cnt = 5	-1.0828	0.0285	1440.825
mpriordef_DEND	L07	Categorical of prior_default_cnt	prior_default_cnt <= 7	-1.3019	0.0279	2183.654
mpriordef_DEND	L10	Categorical of prior_default_cnt	prior_default_cnt <= 10	-1.5663	0.0358	1914.039
mpriordef_DEND	L11	Categorical of prior_default_cnt	prior_default_cnt > 10	-1.7289	0.0559	957.4073
vdeltaUEpr3_DEND_pw1		Variate piecewise of deltaueper3_r[5] (change in unemployment from 3 quarters prior)	median(delta_ue_sa_st_r-(-20),0,10-(-20))	0.00362	0.000396	83.5122
vdeltaUEpr3_DEND_pw2		Variate piecewise of deltaueper3_r[5] (change in unemployment from 3 quarters prior)	max(delta_ue_sa_st_r-10,0)	0.00304	0.000115	695.8715
vUEblend_DEND_pw1		Variate piecewise of ue_blended_r[8] (change in	median(0,ue_blended_r-200,700-200)	-0.00131	0.000051	668.3666

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	WaldChiSq
		unemployment rate)				
vUEblend_DEND_pw2		Variate piecewise of ue_blended_r[8] (change in unemployment rate)	median(0,ue_blended_r-700,900-700)	-0.00193	0.000107	324.6006
mltv_DEND	L00	Categorical of ltv_i_r[7] (loan-to-value)	ltv_i_r=.	-0.571	0.0794	51.6863
mltv_DEND	Z01	Categorical of ltv_i_r[7] (loan-to-value)	base level: else			
vltv_DEND_pw1		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-20,55-20)	-0.0154	0.00244	39.5308
vltv_DEND_pw2		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-55,83-55)	-0.0115	0.000973	140.2214
vltv_DEND_pw3		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-83,96-83)	-0.02	0.0014	204.9156
vloanraw_DEND_pw1		Variate piecewise of loansize_raw	median(0,loansize_raw-98000,180000-98000)	1.40E-06	1.69E-07	67.9208
vloanraw_DEND_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-180000,500000-180000)	1.48E-06	1.04E-07	201.9164
mDeltaTY10_DEND	L01	Categorical of DeltaTy10Init_r[2] (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r < 53	-0.1666	0.0178	87.8078
mDeltaTY10_DEND	Z00	Categorical of DeltaTy10Init_r[2] (change in 10-year Treasury rate from policy inception to current)	base level: else			
mcalperiod_DEND	L200202	Categorical of Calendar Period	period < 200202	-0.5866	0.0185	1008.1
mcalperiod_DEND	Z	Categorical of Calendar Period	base level: else			

Default Transition Model Parameters – FRM15 D_CLM

The model parameters for the FRM15 default to claim transition are shown below.

Table 53: Default to Claim Transition FRM15 Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				-6.5020	0.2009	0.0000
mdpa	1	Categorical of dpa (down payment assistance)	dpa = "govt"	0.3222	0.1372	0.0188

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mdpa	2	Categorical of dpa (down payment assistance)	dpa= "nonprof"	0.3077	0.0357	0.0000
mdpa	3	Categorical of dpa (down payment assistance)	dpa = "relative"	-0.1287	0.0498	0.0097
mdpa	4	Categorical of dpa (down payment assistance)	base level: else			
mperiodnbr_DCLM	L04	Categorical of period number	period_number <= 4	-0.2892	0.1501	0.0540
mperiodnbr_DCLM	L08	Categorical of period number	period_number <= 8	0.1473	0.0542	0.0066
mperiodnbr_DCLM	Z09	Categorical of period number	base level: else			
vperiodnbr_DCLM_pw1		Variate piecewise of period_number	median(0,period_number-8,18-8)	0.0223	0.0063	0.0004
vperiodnbr_DCLM_pw2		Variate piecewise of period_number	median(0,period_number-18,39-18)	0.0071	0.0028	0.0109
vcredit_DCLM_pw3		Variate piecewise of credit_score	median(0,credit_score-645,800-645)	0.0064	0.0004	0.0000
mdurdefepi_DCLM	L02	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 2	1.1203	0.0550	0.0000
mdurdefepi_DCLM	L03	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 3	1.6169	0.0544	0.0000
mdurdefepi_DCLM	L04	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 4	2.0312	0.0540	0.0000
mdurdefepi_DCLM	L05	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 5	2.2209	0.0553	0.0000
mdurdefepi_DCLM	L06	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 6	2.2562	0.0579	0.0000
mdurdefepi_DCLM	L07	Categorical of dur_def_episode (duration of default episode)	dur_def_episode <= 17	2.3457	0.0498	0.0000
mdurdefepi_DCLM	L18	Categorical of dur_def_episode (duration of default episode)	dur_def_episode >= 18	2.2687	0.0630	0.0000
mdurdefepi_DCLM	Z01	Categorical of dur_def_episode (duration of default episode)	base level: else			
vloanraw_DCLM_pw1		Variate piecewise of loansize_raw	median(0,loansize_raw-0,48000-0)	0.0000	0.0000	0.0000
vloanraw_DCLM_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-48000,200000-48000)	0.0000	0.0000	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vloanraw_DCLM_pw3		Variate piecewise of loansize_raw	median(0,loansize_raw-200000,425000-200000)	0.0000	0.0000	0.0013
vdeltaUEinit_DCLM_pw1		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-0,80-0)	-0.0107	0.0014	0.0000
vratiotmptei_DCLM_pw1		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,20-0)	0.0124	0.0017	0.0000
vratiotmptei_DCLM_pw2		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-20,36-20)	0.0073	0.0024	0.0027
vratiotmptei_DCLM_pw3		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-36,50-36)	-0.0163	0.0078	0.0372
mpriordef_DCLM	L01	Categorical of prior_default_cnt	prior_default_cnt = 1	-0.1673	0.0264	0.0000
mpriordef_DCLM	L02	Categorical of prior_default_cnt	prior_default_cnt = 2	-0.3136	0.0348	0.0000
mpriordef_DCLM	L03	Categorical of prior_default_cnt	prior_default_cnt >= 3	-0.4171	0.0398	0.0000
mpriordef_DCLM	Z00	Categorical of prior_default_cnt	base level: else			
vpriordef_DCLM_pw1		Variate piecewise of prior_default_cnt	median(0,prior_default_cnt-3,15-3)	-0.1047	0.0173	0.0000
vsato_DCLM_pw1		Variate piecewise of sato (spread at origination)	min(0,sato-(.4))	0.0940	0.0247	0.0001
mltv_DCLM	Miss	Categorical of ltv_i_r^7 (loan-to-value)	ltv_i = .	0.4660	0.0970	0.0000
mltv_DCLM	Z00	Categorical of ltv_i_r^7 (loan-to-value)	base level: else			
vltv_DCLM_pw1		Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_R-0,65-0)	0.0252	0.0014	0.0000
vltv_DCLM_pw2		Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_R-65,76-65)	0.0270	0.0037	0.0000
vltv_DCLM_pw3		Variate piecewise of ltv_i_r^7 (loan-to-value)	median(0,ltv_i_R-76,93-76)	0.0583	0.0043	0.0000
mhpa2yb_DCLM	L085	Categorical of hpa2y_blended_r^6	0<hpa2y_blended_r <= 85	0.3967	0.0801	0.0000
mhpa2yb_DCLM	Z000	Categorical of hpa2y_blended_r^6	base level: else			
vhpa2yb_DCLM_pw1		Variate piecewise of hpa2y_blended_r^6	median(0,hpa2y_blended_R-85,104-85)	0.0344	0.0036	0.0000
vhpa2yb_DCLM_pw2		Variate piecewise of hpa2y_blended_r^6	median(0,hpa2y_blended_R-104,140-104)	-0.0077	0.0020	0.0002

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vDeltaTY1_DCLM_pw1		Variate piecewise of DeltaTy1Init_r^3 (change in 1-year Treasury rate from policy inception to current)	median(0,DeltaTy1Init_R-0,87-0)	-0.0061	0.0006	0.0000
vDeltaTY1_DCLM_pw2		Variate piecewise of DeltaTy1Init_r^3 (change in 1-year Treasury rate from policy inception to current)	median(0,DeltaTy1Init_R-87,150-87)	-0.0019	0.0007	0.0067
Mperiod_DCLM	L01	Categorical of period (calendar period)	period < 200603	-0.1411	0.0373	0.0002
Mperiod_DCLM	Z01	Categorical of period (calendar period)	base level: else			
mseason_grp_DCLM	L02	Categorical of season	season = "spring"	0.0654	0.0248	0.0084
mseason_grp_DCLM	L03	Categorical of season	season = "summer"	0.0937	0.0247	0.0001
mseason_grp_DCLM	Z0104	Categorical of season	base level: else			
vCCI_DCLM_pw1		Variate piecewise of consumer confidence index	median(0,CCI_r-30,75-30)	0.0253	0.0027	0.0000
vCCI_DCLM_pw2		Variate piecewise of consumer confidence index	median(0,CCI_r-75,110-75)	0.0136	0.0016	0.0000
vCCI_DCLM_pw3		Variate piecewise of consumer confidence index	median(0,CCI_r-110,134-110)	-0.0051	0.0026	0.0444
vSBOI_DCLM_pw1		Variate piecewise of small business optimism index	median(0,SBOI_r-83,95-83)	-0.0532	0.0100	0.0000

Default Transition Model Parameters – FRM15 D_CXM

The model parameters for the FRM15 default to modified cure transition are shown below.

Table 54: Default to Modified Cure Transition FRM15 Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				-4.3009	0.1297	0.0000
mdpa_comb13_DCXM	2	Categorical of dpa (down payment assistance)	dpa= "nonprof"	0.1829	0.0314	0.0000
mdpa_comb13_DCXM	3	Categorical of dpa (down payment assistance)	dpa = "govt" or dpa = "relative"	0.0685	0.0391	0.0797
mdpa_comb13_DCXM	4	Categorical of dpa (down payment assistance)	base level: else			

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mperiodnbr_DCXM	L03	Categorical of period number	period_number <= 3	-1.3321	0.1975	0.0000
mperiodnbr_DCXM	L04	Categorical of period number	period_number = 4	-1.0580	0.1370	0.0000
mperiodnbr_DCXM	L05	Categorical of period number	period_number = 5	-0.8546	0.1031	0.0000
mperiodnbr_DCXM	L06	Categorical of period number	period_number = 6	-0.5365	0.0796	0.0000
mperiodnbr_DCXM	L07	Categorical of period number	period_number = 7	-0.2129	0.0657	0.0012
mperiodnbr_DCXM	Z08	Categorical of period number	base level: else			
vperiodnbr_DCXM_pw1		Variate piecewise of period_number	median(0,period_number-7,14-7)	-0.0206	0.0064	0.0013
vperiodnbr_DCXM_pw3		Variate piecewise of period_number	median(0,period_number-31,48-31)	-0.0061	0.0028	0.0299
vperiodnbr_DCXM_pw4		Variate piecewise of period_number	median(0,period_number-48,60-48)	-0.0171	0.0066	0.0094
mcredit_score_DCXM	L00	Categorical of credit_score	credit_score = 0	-0.3456	0.0746	0.0000
mcredit_score_DCXM	Z00	Categorical of credit_score	base level: else			
vcredit_DCXM_pw1		Variate piecewise of credit_score	median(0,credit_score-450,545-450)	-0.0037	0.0008	0.0000
vcredit_DCXM_pw2		Variate piecewise of credit_score	median(0,credit_score-545,800-545)	-0.0015	0.0002	0.0000
mdurdefepi_DCXM	L02	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 2	0.4220	0.0241	0.0000
mdurdefepi_DCXM	L03	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 3	0.5937	0.0259	0.0000
mdurdefepi_DCXM	L04	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 4	0.5790	0.0288	0.0000
mdurdefepi_DCXM	L05	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 5	0.4769	0.0330	0.0000
mdurdefepi_DCXM	L06	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 6	0.3995	0.0376	0.0000
mdurdefepi_DCXM	L07	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 7	0.1903	0.0450	0.0000
mdurdefepi_DCXM	L08	Categorical of dur_def_episode (duration of default episode)	dur_def_episode >= 8	-0.0083	0.0399	0.8354
mdurdefepi_DCXM	Z01	Categorical of dur_def_episode (duration of default episode)	base level: else			

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vdurdefepi_DCXM_pw1		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-7,29-7)	-0.0540	0.0053	0.0000
vloanraw_DCXM_pw1		Variate piecewise of loansize_raw	median(0,loansize_raw-0,62000-0)	0.0000	0.0000	0.0000
vloanraw_DCXM_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-62000,97000-62000)	0.0000	0.0000	0.0036
vloanraw_DCXM_pw3		Variate piecewise of loansize_raw	median(0,loansize_raw-97000,200000-97000)	0.0000	0.0000	0.0000
vloanraw_DCXM_pw4		Variate piecewise of loansize_raw	median(0,loansize_raw-200000,425000-200000)	0.0000	0.0000	0.0336
vDeltaUEinit_DCXM_pw2		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-95,184-95)	0.0024	0.0004	0.0000
mRatioTmpTei_DCXM	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	0.5812	0.0594	0.0000
mRatioTmpTei_DCXM	Z00	Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_DCXM_pw1		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,24-0)	0.0275	0.0028	0.0000
vratiotmptei_DCXM_pw2		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-24,50-24)	0.0069	0.0019	0.0003
mpriordef_DCXM	L01	Categorical of prior_default_cnt	prior_default_cnt = 1	0.2280	0.0229	0.0000
mpriordef_DCXM	L02	Categorical of prior_default_cnt	prior_default_cnt = 2	0.2822	0.0262	0.0000
mpriordef_DCXM	L07	Categorical of prior_default_cnt	prior_default_cnt >= 7	0.1962	0.0455	0.0000
mpriordef_DCXM	PW1	Categorical of prior_default_cnt	3 <= prior_default_cnt <= 6	0.2894	0.0251	0.0000
mpriordef_DCXM	Z00	Categorical of prior_default_cnt	base level: else			
vsato_DCXM_pw1		Variate piecewise of sato (spread at origination)	min(0,sato-(-.56))	0.1492	0.0516	0.0038
vsato_DCXM_pw4		Variate piecewise of sato (spread at origination)	max(sato-.2,0)	-0.1463	0.0398	0.0002
vltv_DCXM_pw2		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-20,92-20)	0.0076	0.0008	0.0000
vltv_DCXM_pw3		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-92,100-92)	0.2387	0.0407	0.0000
mhpa2yb_DCXM	L084	Categorical of hpa2y_blended_r[6]	hpa2y_blended_R <=84	-0.2181	0.0482	0.0000
mhpa2yb_DCXM	Z00	Categorical of hpa2y_blended_r[6]	base level: else			

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vhpa2yb_DCXM_pw2		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_R-100,116-100)	0.0074	0.0021	0.0004
muest_DCXM	L42	Categorical of ue_sa_st_r[10] (seasonally adjusted state unemployment)	ue_sa_st_r<=420	-0.0182	0.0322	0.5710
muest_DCXM	L79	Categorical of ue_sa_st_r[10] (seasonally adjusted state unemployment)	ue_sa_st_r>790	-0.0925	0.0224	0.0000
muest_DCXM	Z00	Categorical of ue_sa_st_r[10] (seasonally adjusted state unemployment)	base level: else			
mseason_grp_DCXM	L02	Categorical of season	season = "spring"	0.1281	0.0194	0.0000
mseason_grp_DCXM	L03	Categorical of season	season = "summer"	0.0881	0.0195	0.0000
mseason_grp_DCXM	Z0104	Categorical of season	base level: else			
vCCI_DCXM_pw1		Variate piecewise of consumer confidence index	median(0,CCI_r-30,75-30)	-0.0071	0.0011	0.0000
vCCI_DCXM_pw2		Variate piecewise of consumer confidence index	median(0,CCI_r-75,110-75)	0.0086	0.0010	0.0000
vCCI_DCXM_pw3		Variate piecewise of consumer confidence index	median(0,CCI_r-110,134-110)	-0.0172	0.0021	0.0000

Default Transition Model Parameters – FRM15 D_CXS

The model parameters for the FRM15 default to self-cure transition are shown below.

Table 55: Default to Self-Cure Transition FRM15 Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				0.3080	0.0906	0.0007
mjudicial	1	Categorical of judicial (judicial state)	judicial = 1	-0.0924	0.0062	0.0000
mjudicial	2	Categorical of judicial (judicial state)	base level: else			
mdpa	1	Categorical of dpa (down payment assistance)	dpa = "govt"	-0.1941	0.0639	0.0024
mdpa	2	Categorical of dpa (down payment assistance)	dpa= "nonprof"	-0.3588	0.0195	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mdpa	3	Categorical of dpa (down payment assistance)	dpa = "relative"	-0.0213	0.0182	0.2422
mdpa	4	Categorical of dpa (down payment assistance)	base level: else			
mrfnc_ind	1	Categorical of rfnc_ind (refinanced loan indicator)	refinanced, non-streamlined	-0.0202	0.0108	0.0620
mrfnc_ind	2	Categorical of rfnc_ind (refinanced loan indicator)	streamlined refinanced	0.1136	0.0149	0.0000
mrfnc_ind	3	Categorical of rfnc_ind (refinanced loan indicator)	base level: else			
mperiodnbr_DCXS	L02	Categorical of period number	period_number = 2	1.3359	0.0659	0.0000
mperiodnbr_DCXS	L03	Categorical of period number	period_number = 3	0.6374	0.0352	0.0000
mperiodnbr_DCXS	L04	Categorical of period number	period_number = 4	0.3465	0.0287	0.0000
mperiodnbr_DCXS	L05	Categorical of period number	period_number = 5	0.2359	0.0253	0.0000
mperiodnbr_DCXS	L06	Categorical of period number	period_number = 6	0.1882	0.0231	0.0000
mperiodnbr_DCXS	L07	Categorical of period number	period_number = 7	0.1617	0.0218	0.0000
mperiodnbr_DCXS	L08	Categorical of period number	period_number = 8	0.1218	0.0211	0.0000
mperiodnbr_DCXS	Z09	Categorical of period number	base level: else			
vperiodnbr_DCXS_pw1		Variate piecewise of period_number	median(0,period_number-8,31-8)	0.0034	0.0007	0.0000
vperiodnbr_DCXS_pw2		Variate piecewise of period_number	median(0,period_number-31,52-31)	-0.0027	0.0008	0.0010
mcredit_score_DCXS	L00	Categorical of credit_score	credit_score = 0	0.3895	0.0216	0.0000
mcredit_score_DCXS	Z00	Categorical of credit_score	base level: else			
vcredit_DCXS_pw1		Variate piecewise of credit_score	median(0,credit_score-465,643-465)	0.0036	0.0001	0.0000
vcredit_DCXS_pw2		Variate piecewise of credit_score	median(0,credit_score-643,800-643)	0.0013	0.0001	0.0000
mdurdefepi_DCXS	L02	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 2	-0.6432	0.0079	0.0000
mdurdefepi_DCXS	L03	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 3	-0.9850	0.0101	0.0000
mdurdefepi_DCXS	L04	Categorical of dur_def_episode	dur_def_episode = 4	-1.3624	0.0132	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		(duration of default episode)				
mdurdefepi_DCXS	L05	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 5	-1.5180	0.0160	0.0000
mdurdefepi_DCXS	L06	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 6	-1.7083	0.0194	0.0000
mdurdefepi_DCXS	L07	Categorical of dur_def_episode (duration of default episode)	dur_def_episode <= 7	-2.0404	0.0181	0.0000
mdurdefepi_DCXS	Z01	Categorical of dur_def_episode (duration of default episode)	base level: else			
vdurdefepi_DCXS_pw1		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-6,20-6)	-0.0548	0.0025	0.0000
vloanraw_DCXS_pw1		Variate piecewise of loansize_raw	median(0,loansize_raw-0,37000-0)	0.0000	0.0000	0.0346
vloanraw_DCXS_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-37000,130000-37000)	0.0000	0.0000	0.0018
vloanraw_DCXS_pw3		Variate piecewise of loansize_raw	median(0,loansize_raw-130000,200000-130000)	0.0000	0.0000	0.0000
vdeltaUEinit_DCXS_pw1		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-0,78-0)	0.0014	0.0005	0.0019
vdeltaUEinit_DCXS_pw2		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-78,107-78)	-0.0034	0.0005	0.0000
vdeltaUEinit_DCXS_pw3		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-107,125-107)	-0.0037	0.0008	0.0000
vdeltaUEinit_DCXS_pw4		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-125,200-125)	-0.0018	0.0002	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mRatioTmpTei_DCXS	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	-0.3188	0.0574	0.0000
mRatioTmpTei_DCXS	Z00	Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_DCXS_pw1		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,12-0)	-0.0156	0.0049	0.0016
vratiotmptei_DCXS_pw2		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-12,28-12)	-0.0156	0.0008	0.0000
vratiotmptei_DCXS_pw3		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-28,50-28)	-0.0065	0.0011	0.0000
mpriordef_DCXS	L01	Categorical of prior_default_cnt	prior_default_cnt = 1	-0.1602	0.0087	0.0000
mpriordef_DCXS	L02	Categorical of prior_default_cnt	prior_default_cnt = 2	-0.2013	0.0102	0.0000
mpriordef_DCXS	L07	Categorical of prior_default_cnt	prior_default_cnt >= 7	-0.1556	0.0315	0.0000
mpriordef_DCXS	PW1	Categorical of prior_default_cnt	3 <= prior_default_cnt <= 6	-0.1932	0.0148	0.0000
mpriordef_DCXS	Z00	Categorical of prior_default_cnt	base level: else			
vpriordef_DCXS_pw1		Variate piecewise of prior_default_cnt	median(0,prior_default_cnt-2,7-2)	-0.0130	0.0058	0.0237
vsato_DCXS_pw2		Variate piecewise of sato (spread at origination)	median(sato-(-.4),0,.14-(-.4))	-0.0669	0.0158	0.0000
vsato_DCXS_pw3		Variate piecewise of sato (spread at origination)	max(sato-.14,0)	-0.0661	0.0157	0.0000
vltv_DCXS_pw1		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-0,19-0)	0.0147	0.0010	0.0000
vltv_DCXS_pw2		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-19,83-19)	-0.0075	0.0003	0.0000
vltv_DCXS_pw3		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-83,88-83)	-0.0285	0.0046	0.0000
vltv_DCXS_pw4		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-88,91-88)	-0.0353	0.0122	0.0038
vltv_DCXS_pw5		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-91,100-91)	-0.0270	0.0118	0.0226
vUEblend_DCXS_pw1		Variate piecewise of ue_blended_r[8] (change in unemployment rate)	median(0,ue_blended_R-0,525-0)	-0.0003	0.0001	0.0000
vUEblend_DCXS_pw2		Variate piecewise of ue_blended_r[8] (change in	median(0,ue_blended_R-525,800-525)	-0.0002	0.0000	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		unemployment rate)				
vUEblend_DCXS_pw3		Variate piecewise of ue_blended_r[8] (change in unemployment rate)	median(0,ue_blended_R-800,1500-800)	-0.0003	0.0000	0.0000
vDeltaTY1_DCXS_pw1		Variate piecewise of DeltaTy1Init_r[3] (change in 1-year Treasury rate from policy inception to current)	median(0,DeltaTy1Init_R-0,22-0)	-0.0071	0.0007	0.0000
vDeltaTY1_DCXS_pw2		Variate piecewise of DeltaTy1Init_r[3] (change in 1-year Treasury rate from policy inception to current)	median(0,DeltaTy1Init_R-22,80-22)	0.0015	0.0002	0.0000
mseason_grp_DCXS	L02	Categorical of season	season = "spring"	0.1265	0.0074	0.0000
mseason_grp_DCXS	L03	Categorical of season	season = "summer"	-0.0227	0.0076	0.0029
mseason_grp_DCXS	Z0104	Categorical of season	base level: else			
vCCI_DCXS_pw1		Variate piecewise of consumer confidence index	median(0,CCI_r-30,75-30)	-0.0017	0.0007	0.0229
vCCI_DCXS_pw2		Variate piecewise of consumer confidence index	median(0,CCI_r-75,110-75)	0.0034	0.0006	0.0000
vCCI_DCXS_pw3		Variate piecewise of consumer confidence index	median(0,CCI_r-110,134-110)	0.0190	0.0008	0.0000
vSBOI_DCXS_pw1		Variate piecewise of small business optimism index	median(0,SBOI_r-83,95-83)	-0.0105	0.0029	0.0003
vSBOI_DCXS_pw2		Variate piecewise of small business optimism index	median(0,SBOI_r-95,100-95)	-0.0974	0.0031	0.0000

Default Transition Model Parameters – FRM15 D_END

The model parameters for the fixed rate 15-year mortgage default to end transition are shown below.

Table 56: Default to End Transition FRM15 Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				-2.0396	0.1190	0.0000
mdpa	1	Categorical of dpa (down payment assistance)	dpa = "govt"	-0.3812	0.2407	0.1133

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mdpa	2	Categorical of dpa (down payment assistance)	dpa= "nonprof"	-0.3520	0.0678	0.0000
mdpa	3	Categorical of dpa (down payment assistance)	dpa = "relative"	0.0766	0.0537	0.1536
mdpa	4	Categorical of dpa (down payment assistance)	base level: else			
mfrst_tm_by	1	Categorical of frst_tm_by (first-time buyer)	frst_tm_by = "Y"	0.0903	0.0287	0.0017
mfrst_tm_by	2	Categorical of frst_tm_by (first-time buyer)	base level: else			
vhpa2yb_DEND_pw2		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_R-104,140-104)	0.0273	0.0014	0.0000
vperiodnbr_DEND_pw1		Variate piecewise of period_number	median(0,period_number-10,30-10)	0.0082	0.0021	0.0000
vperiodnbr_DEND_pw2		Variate piecewise of period_number	median(0,period_number-30,52-30)	0.0073	0.0023	0.0013
vperiodnbr_DEND_pw3		Variate piecewise of period_number	median(0,period_number-52,60-52)	0.1780	0.0065	0.0000
mcredit_score_DEND	L00	Categorical of credit_score	credit_score = 0	0.7737	0.0502	0.0000
mcredit_score_DEND	Z00	Categorical of credit_score	base level: else			
vcredit_DEND_pw1		Variate piecewise of credit_score	median(0,credit_score-470,800-470)	0.0044	0.0002	0.0000
vdurdefepi_DEND_pw1		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode,12)	-0.1813	0.0035	0.0000
vdurdefepi_DEND_pw2		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-12,54-12)	0.0095	0.0035	0.0059
vloanraw_DEND_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-55000,120000-55000)	0.0000	0.0000	0.0000
vloanraw_DEND_pw3		Variate piecewise of loansize_raw	median(0,loansize_raw-120000,200000-120000)	0.0000	0.0000	0.0000
vloanraw_DEND_pw4		Variate piecewise of loansize_raw	median(0,loansize_raw-200000,425000-200000)	0.0000	0.0000	0.0570
vdeltaUEinit_DEND_pw1		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_R-0,175-0)	0.0020	0.0004	0.0000
mpriordef_DEND	L01	Categorical of prior_default_cnt	prior_default_cnt = 1	-0.3884	0.0237	0.0000
mpriordef_DEND	L02	Categorical of prior_default_cnt	prior_default_cnt = 2	-0.5694	0.0292	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mpriordef_DEND	L03	Categorical of prior_default_cnt	prior_default_cnt >= 3	-0.8273	0.0296	0.0000
mpriordef_DEND	Z00	Categorical of prior_default_cnt	base level: else			
vpriordef_DEND_pw1		Variate piecewise of prior_default_cnt	median(0,prior_default_cnt-3,14-3)	-0.0662	0.0078	0.0000
vUEblend_DEND_pw1		Variate piecewise of ue_blended_r[8] (change in unemployment rate)	median(0,ue_blended_R-0,800-0)	-0.0012	0.0001	0.0000
vUEblend_DEND_pw2		Variate piecewise of ue_blended_r[8] (change in unemployment rate)	median(0,ue_blended_R-800,1500-800)	-0.0011	0.0001	0.0000
mltv_DEND	Miss	Categorical of ltv_i_r[7] (loan-to-value)	ltv_i = .	-0.5091	0.0473	0.0000
mltv_DEND	Z00	Categorical of ltv_i_r[7] (loan-to-value)	base level: else			
vltv_DEND_pw1		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-0,63-0)	-0.0174	0.0010	0.0000
vltv_DEND_pw2		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_R-63,100-63)	-0.0168	0.0018	0.0000
vDeltaTY1_DEND_pw2		Variate piecewise of DeltaTy1Init_r[3] (change in 1-year Treasury rate from policy inception to current)	median(0,DeltaTy1Init_R-6,200-6)	0.0011	0.0002	0.0000
Mperiod_DEND	L01	Categorical of period (calendar period)	period < 200603	0.2798	0.0409	0.0000
Mperiod_DEND	Z01	Categorical of period (calendar period)	base level: else			
mseason_grp_DEND	L02	Categorical of season	season = "spring"	0.0682	0.0211	0.0012
mseason_grp_DEND	L03	Categorical of season	season = "summer"	0.1317	0.0210	0.0000
mseason_grp_DEND	Z0104	Categorical of season	base level: else			
vCCI_DEND_pw3		Variate piecewise of consumer confidence index	median(0,CCI_r-110,134-110)	-0.0092	0.0023	0.0000
vSBOI_DEND_pw1		Variate piecewise of small business optimism index	median(0,SBOI_r-83,95-83)	-0.0244	0.0050	0.0000
vSBOI_DEND_pw2		Variate piecewise of small business optimism index	median(0,SBOI_r-95,100-95)	0.0254	0.0085	0.0028

Default Transition Model Parameters – ARM D_CLM

The model parameters for the ARM default to claim transition are shown below.

Table 57: Default to Claim Transition ARM Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				-5.8513	0.2772	0.0000
mjudicial	1	Categorical of judicial (judicial state)	judicial = 1 , judicial state	-0.1659	0.0103	0.0000
mjudicial	2	Categorical of judicial (judicial state)	base level: else, non-judicial state			
mdpa	1	Categorical of dpa (down payment assistance)	dpa = "govt"	0.3891	0.0444	0.0000
mdpa	2	Categorical of dpa (down payment assistance)	dpa= "nonprof"	0.4671	0.0158	0.0000
mdpa	3	Categorical of dpa (down payment assistance)	dpa = "relative"	0.0272	0.0167	0.1024
mdpa	4	Categorical of dpa (down payment assistance)	base level: else			
mfrst_tm_by	1	Categorical of frst_tm_by (first-time buyer)	frst_tm_by = "Y"	-0.2049	0.0125	0.0000
mfrst_tm_by	2	Categorical of frst_tm_by (first-time buyer)	base level: else			
mycslope_DCLM	L01	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r<=111	-0.2315	0.0205	0.0000
mycslope_DCLM	L02	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r>=875	-0.3236	0.0237	0.0000
mycslope_DCLM	L03	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r>=2000	0.0356	0.0263	0.1762
mycslope_DCLM	Z00	Categorical of ycslope_r[9] (yield curve slope)	base level: else			
mperiodnbr_DCLM	L02	Categorical of period_number	period_number <= 2	-0.5289	0.3617	0.1436
mperiodnbr_DCLM	L03	Categorical of period_number	period_number = 3	-0.8909	0.1366	0.0000
mperiodnbr_DCLM	L04	Categorical of period_number	period_number = 4	-0.7761	0.0826	0.0000
mperiodnbr_DCLM	Z05	Categorical of period_number	base level: else			
vperiodnbr_DCLM_pw2		Variate piecewise of period_number	median(0,period_number-10,18-10)	0.0412	0.0024	0.0000
vperiodnbr_DCLM_pw3		Variate piecewise of period_number	median(0,period_number-18,64-18)	-0.0166	0.0009	0.0000
vperiodnbr_DCLM_pw4		Variate piecewise of period_number	median(0,period_number-64,108-64)	0.0120	0.0033	0.0003

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mcredit_DCLM	L01	Categorical of credit_score	credit_score = 0	0.4015	0.0628	0.0000
mcredit_DCLM	Z00	Categorical of credit_score	base level: else			
vcredit_DCLM_pw1		Variate piecewise of credit_score	median(0,credit_score-300,720-300)	0.0009	0.0002	0.0000
vcredit_DCLM_pw2		Variate piecewise of credit_score	median(0,credit_score-720,800-720)	0.0067	0.0009	0.0000
vdurdefepi_DCLM_pw1		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-10,30-10)	-0.0061	0.0015	0.0000
vdurdefepi_DCLM_pw2		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-30,40-30)	-0.0517	0.0076	0.0000
vdeltaUEinit_dclm_pw1		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-0,63-0)	0.0039	0.0019	0.0424
vdeltaUEinit_dclm_pw2		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-63,100-63)	-0.0028	0.0007	0.0001
vdeltaUEinit_dclm_pw3		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-100,116-100)	0.0069	0.0012	0.0000
vdeltaUEinit_dclm_pw4		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-116,218-116)	0.0008	0.0003	0.0025
vdeltaUEinit_dclm_pw5		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-218,330-218)	0.0012	0.0004	0.0046
mRatioTmpTei_DCLM	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	0.1139	0.0165	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mRatioTmpTei_DCLM	Z00	Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_DCLM_pw2		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-24,36-24)	0.0059	0.0014	0.0000
vratiotmptei_DCLM_pw3		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-36,50-36)	-0.0131	0.0030	0.0000
mpriordef_DCLM	L01	Categorical of prior_default_cnt	prior_default_cnt = 1	-0.3613	0.0128	0.0000
mpriordef_DCLM	L02	Categorical of prior_default_cnt	prior_default_cnt = 2	-0.5620	0.0171	0.0000
mpriordef_DCLM	L03	Categorical of prior_default_cnt	3 <= prior_default_cnt <= 8	-0.8538	0.0177	0.0000
mpriordef_DCLM	L04	Categorical of prior_default_cnt	9 <= prior_default_cnt <= 13	-1.5255	0.0643	0.0000
mpriordef_DCLM	L05	Categorical of prior_default_cnt	prior_default_cnt >= 14	-2.5301	0.2912	0.0000
mpriordef_DCLM	Z00	Categorical of prior_default_cnt	base level: 0			
vloanraw_DCLM_pw1		Variate piecewise of loansize_raw	median(0,loansize_raw-30000,109000-30000)	0.0000	0.0000	0.0000
vloanraw_DCLM_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-109000,143000-109000)	0.0000	0.0000	0.0000
vloanraw_DCLM_pw3		Variate piecewise of loansize_raw	median(0,loansize_raw-143000,200000-143000)	0.0000	0.0000	0.0000
vloanraw_DCLM_pw4		Variate piecewise of loansize_raw	median(0,loansize_raw-200000,425000-200000)	0.0000	0.0000	0.0000
mltv_DCLM	L01	Categorical of ltv_i_r[7] (loan-to-value)	ltv_i_r = .	0.2048	0.1134	0.0709
mltv_DCLM	Z00	Categorical of ltv_i_r[7] (loan-to-value)	base level: else			
vltv_DCLM_pw1		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-0,70-0)	0.0211	0.0031	0.0000
vltv_DCLM_pw2		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-70,81-70)	0.0080	0.0025	0.0013
vltv_DCLM_pw3		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-81,94-81)	0.0220	0.0018	0.0000
mhpa2yb_DCLM	L085	Categorical of hpa2y_blended_r[6]	hpa2y_blended_r <= 85	0.2113	0.0316	0.0000
mhpa2yb_DCLM	Z000	Categorical of hpa2y_blended_r[6]	base level: else			
vhpa2yb_DCLM_pw1		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-85,98-85)	0.0063	0.0027	0.0181
vhpa2yb_DCLM_pw2		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-98,108-98)	0.0102	0.0024	0.0000
vhpa2yb_DCLM_pw3		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-108,130-108)	-0.0175	0.0011	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vhpa2yb_DCLM_pw4		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-130,180-130)	-0.0573	0.0041	0.0000
vUEblend_DCLM_pw1		Variate piecewise of ue_blended_r[8] (change in unemployment rate)	median(200,ue_blended_r,450)	0.0012	0.0003	0.0000
vUEblend_DCLM_pw2		Variate piecewise of ue_blended_r[8] (change in unemployment rate)	median(0,ue_blended_r-450,850-450)	-0.0005	0.0001	0.0000
vUEblend_DCLM_pw3		Variate piecewise of ue_blended_r[8] (change in unemployment rate)	median(0,ue_blended_r-850,1500-850)	0.0003	0.0001	0.0000
vdeltaUEpr3_DCLM_pw1		Variate piecewise of deltauepr3_r[5] (change in unemployment from 3 quarters prior)	median(deltauepr3_r-(-200),0,(-20)-(-200))	-0.0016	0.0003	0.0000
vdeltaUEpr3_DCLM_pw3		Variate piecewise of deltauepr3_r[5] (change in unemployment from 3 quarters prior)	median(deltauepr3_r-10,0,200-10)	-0.0011	0.0002	0.0000
vprior3uest_DCLM_pw1		Variate piecewise of prior3_ue_sa_st (change in prior-3 seasonally adjusted unemployment rate)	median(2.4,prior3_ue_sa_st,5)	0.1713	0.0197	0.0000
vprior3uest_DCLM_pw2		Variate piecewise of prior3_ue_sa_st (change in prior-3 seasonally adjusted unemployment rate)	median(0,prior3_ue_sa_st-5,12.3-5)	0.0548	0.0084	0.0000
mDeltaTY10_DCLM	L01	Categorical of DeltaTy10Init_r[2] (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r < 53	0.2622	0.0178	0.0000
mDeltaTY10_DCLM	Z00	Categorical of DeltaTy10Init_r[2] (change in 10-year Treasury rate from policy inception to current)	base level: else			

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mseason_grp_DCLM	L02	Categorical of season	season = "spring"	0.0460	0.0119	0.0001
mseason_grp_DCLM	L03	Categorical of season	season = "summer"	0.0463	0.0120	0.0001
mseason_grp_DCLM	Z0104	Categorical of season	base level: else			
vCCI_DCLM_pw1		Variate piecewise of consumer confidence index	median(0,CCI_r-30,75-30)	0.0102	0.0014	0.0000
vCCI_DCLM_pw2		Variate piecewise of consumer confidence index	median(0,CCI_r-75,110-75)	0.0028	0.0008	0.0005
vCCI_DCLM_pw3		Variate piecewise of consumer confidence index	median(0,CCI_r-110,134-110)	0.0281	0.0022	0.0000
vSBOI_DCLM_pw1		Variate piecewise of small business optimism index	median(0,SBOI_r-83,95-83)	-0.0350	0.0053	0.0000
vSBOI_DCLM_pw2		Variate piecewise of small business optimism index	median(0,SBOI_r-95,100-95)	-0.0133	0.0053	0.0113
vSBOI_DCLM_pw3		Variate piecewise of small business optimism index	median(0,SBOI_r-100,108-100)	-0.0345	0.0050	0.0000

Default Transition Model Parameters – ARM D_CXM

The model parameters for the ARM default to modified cure transition are shown below.

Table 58: Default to Modified Cure Transition ARM Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				-4.1901	0.2129	0.0000
mdpa	1	Categorical of dpa (down payment assistance)	dpa = "govt"	0.1402	0.0535	0.0088
mdpa	2	Categorical of dpa (down payment assistance)	dpa= "nonprof"	0.1650	0.0181	0.0000
mdpa	3	Categorical of dpa (down payment assistance)	dpa = "relative"	0.0564	0.0190	0.0029
mdpa	4	Categorical of dpa (down payment assistance)	base level: else			
mfrst_tm_by	1	Categorical of frst_tm_by (first-time buyer)	frst_tm_by = "Y"	0.0419	0.0172	0.0149
mfrst_tm_by	2	Categorical of frst_tm_by (first-time buyer)	base level: else			
mrfnc_ind	2	Categorical of rfnc_ind	rfnc_ind <> "N"	0.0570	0.0242	0.0185

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		(refinanced loan indicator)				
mrfnc_ind	3	Categorical of rfnc_ind (refinanced loan indicator)	base level: else			
mycslope_DCXM	L01	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r<=111	0.0041	0.0298	0.8916
mycslope_DCXM	L02	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r>=875	0.2425	0.0261	0.0000
mycslope_DCXM	L03	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r>=2000	0.4355	0.0285	0.0000
mycslope_DCXM	Z00	Categorical of ycslope_r[9] (yield curve slope)	base level: else			
mperiodnbr_DCXM	L02	Categorical of period_number	period_number <= 2	-1.8680	1.0041	0.0628
mperiodnbr_DCXM	L03	Categorical of period_number	period_number = 3	-0.6562	0.2261	0.0037
mperiodnbr_DCXM	L04	Categorical of period_number	period_number = 4	-0.5630	0.1504	0.0002
mperiodnbr_DCXM	Z05	Categorical of period_number	base level: else			
vperiodnbr_DCXM_pw1		Variate piecewise of period_number	median(0,period_number-5,9-5)	0.1661	0.0148	0.0000
vperiodnbr_DCXM_pw2		Variate piecewise of period_number	median(0,period_number-9,18-9)	-0.0123	0.0031	0.0000
vperiodnbr_DCXM_pw3		Variate piecewise of period_number	median(0,period_number-18,36-18)	-0.0147	0.0018	0.0000
vperiodnbr_DCXM_pw4		Variate piecewise of period_number	median(0,period_number-36,50-36)	0.0160	0.0022	0.0000
vperiodnbr_DCXM_pw5		Variate piecewise of period_number	median(0,period_number-50,108-50)	-0.0068	0.0016	0.0000
mcredit_DCXM	L01	Categorical of credit_score	credit_score = 0	-0.2209	0.0311	0.0000
mcredit_DCXM	L02	Categorical of credit_score	credit_score<525	-0.0524	0.0529	0.3217
mcredit_DCXM	Z00	Categorical of credit_score	base level: else			
vcredit_DCXM_pw1		Variate piecewise of credit_score	median(0,credit_score-525,645-525)	-0.0017	0.0003	0.0000
vcredit_DCXM_pw2		Variate piecewise of credit_score	median(0,credit_score-645,800-645)	-0.0024	0.0004	0.0000
vdurdefepi_DCXM_pw1		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-5,7-5)	-0.0883	0.0086	0.0000
vdurdefepi_DCXM_pw2		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-7,40-7)	-0.0577	0.0023	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vdeltaUEinit_DCXM_pw1		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-0,63-0)	0.0046	0.0018	0.0096
vdeltaUEinit_DCXM_pw2		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-63,100-63)	-0.0052	0.0007	0.0000
vdeltaUEinit_DCXM_pw4		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-116,218-116)	0.0016	0.0003	0.0000
vdeltaUEinit_DCXM_pw5		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,deltaUEinit_r-218,330-218)	0.0011	0.0004	0.0026
mRatioTmpTei_DCXM	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	0.4322	0.0538	0.0000
mRatioTmpTei_DCXM	Z00	Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_DCXM_pw1		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,24-0)	0.0165	0.0024	0.0000
vratiotmptei_DCXM_pw2		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-24,36-24)	0.0051	0.0017	0.0019
mpriordef_DCXM	L01	Categorical of prior_default_cnt	prior_default_cnt = 1	0.3361	0.0173	0.0000
mpriordef_DCXM	L02	Categorical of prior_default_cnt	prior_default_cnt = 2	0.4558	0.0195	0.0000
mpriordef_DCXM	L03	Categorical of prior_default_cnt	3 <= prior_default_cnt <= 8	0.6137	0.0193	0.0000
mpriordef_DCXM	L04	Categorical of prior_default_cnt	9 <= prior_default_cnt <= 13	0.5149	0.0401	0.0000
mpriordef_DCXM	L05	Categorical of prior_default_cnt	prior_default_cnt >= 14	0.3774	0.1075	0.0004
mpriordef_DCXM	Z00	Categorical of prior_default_cnt	base level: 0			
vsato_DCXM_pw1		Variate piecewise of sato (spread at origination)	min(0,sato-(-.1))	-0.0294	0.0098	0.0027
vloanraw_DCXM_pw1		Variate piecewise of loansize_raw	median(30000,loansize_raw,109000)	0.0000	0.0000	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vloanraw_DCXM_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-109000,143000-109000)	0.0000	0.0000	0.0000
vloanraw_DCXM_pw4		Variate piecewise of loansize_raw	median(0,loansize_raw-200000,425000-200000)	0.0000	0.0000	0.0328
vltv_DCXM_pw1		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-0,68-0)	0.0059	0.0018	0.0011
vltv_DCXM_pw2		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-68,81-68)	0.0094	0.0023	0.0000
vltv_DCXM_pw3		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-81,91-81)	-0.0066	0.0026	0.0112
vhpa2yb_DCXM_pw2		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-98,108-98)	-0.0312	0.0024	0.0000
vhpa2yb_DCXM_pw4		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-117,180-117)	-0.0156	0.0022	0.0000
vdeltaUEpr3_DCXM_pw1		Variate piecewise of deltaueprs3_r[5] (change in unemployment from 3 quarters prior)	median(deltaueprs3_r-(-200),0,(-20)-(-200))	-0.0009	0.0003	0.0049
vdeltaUEpr3_DCXM_pw2		Variate piecewise of deltaueprs3_r[5] (change in unemployment from 3 quarters prior)	median(deltaueprs3_r-(-20),0,10-(-20))	0.0029	0.0007	0.0000
vdeltaUEpr3_DCXM_pw3		Variate piecewise of deltaueprs3_r[5] (change in unemployment from 3 quarters prior)	median(deltaueprs3_r-10,0,200-10)	-0.0017	0.0002	0.0000
vprior3uest_DCXM_pw1		Variate piecewise of prior3_ue_sa_st (change in prior-3 seasonally adjusted unemployment rate)	median(2.4,prior3_ue_sa_st,5)	-0.0356	0.0170	0.0359
vprior3uest_DCXM_pw2		Variate piecewise of prior3_ue_sa_st (change in prior-3 seasonally adjusted unemployment rate)	median(0,prior3_ue_sa_st-5,12.3-5)	-0.0531	0.0057	0.0000
mDeltaTY10_DCXM	L01	Categorical of DeltaTy10Init_r[2] (change in 10-year Treasury rate from	DeltaTy10Init_r < 53	-0.2716	0.0174	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		policy inception to current)				
mDeltaTY10_DCXM	Z00	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	base level: else			
mseason_grp_DCXM	L02	Categorical of season	season = "spring"	0.1351	0.0138	0.0000
mseason_grp_DCXM	L03	Categorical of season	season = "summer"	-0.0203	0.0141	0.1513
mseason_grp_DCXM	Z0104	Categorical of season	base level: else			
vCCI_DCXM_pw1		Variate piecewise of consumer confidence index	median(0,CCI_r-30,75-30)	-0.0145	0.0015	0.0000
vCCI_DCXM_pw2		Variate piecewise of consumer confidence index	median(0,CCI_r-75,110-75)	0.0496	0.0013	0.0000
vCCI_DCXM_pw3		Variate piecewise of consumer confidence index	median(0,CCI_r-110,134-110)	0.0836	0.0030	0.0000
vSBOI_DCXM_pw1		Variate piecewise of small business optimism index	median(0,SBOI_r-83,95-83)	-0.0351	0.0058	0.0000
vSBOI_DCXM_pw2		Variate piecewise of small business optimism index	median(0,SBOI_r-95,100-95)	-0.4316	0.0083	0.0000
vSBOI_DCXM_pw3		Variate piecewise of small business optimism index	median(0,SBOI_r-100,108-100)	-0.1329	0.0110	0.0000

Default Transition Model Parameters – ARM D_CXS

The model parameters for the ARM default to self-cure transition are shown below.

Table 59: Default to Self-Cure Transition ARM Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				0.6976	0.0627	0.0000
mjudicial	1	Categorical of judicial (judicial state)	judicial = 1 , judicial state	-0.1410	0.0055	0.0000
mjudicial	2	Categorical of judicial (judicial state)	base level: else, non-judicial state			
mdpa	1	Categorical of dpa (down payment assistance)	dpa = "govt"	-0.2256	0.0297	0.0000
mdpa	2	Categorical of dpa (down payment assistance)	dpa= "nonprof"	-0.2412	0.0096	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mdpa	3	Categorical of dpa (down payment assistance)	dpa = "relative"	-0.0018	0.0086	0.8349
mdpa	4	Categorical of dpa (down payment assistance)	base level: else			
mrfnc_ind	2	Categorical of rfnc_ind (refinanced loan indicator)	rfnc_ind <> "N"	-0.1312	0.0094	0.0000
mrfnc_ind	3	Categorical of rfnc_ind (refinanced loan indicator)	base level: else			
mycslope_DCXS	L01	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r<=111	-0.2148	0.0110	0.0000
mycslope_DCXS	L02	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r>=875	0.1113	0.0119	0.0000
mycslope_DCXS	L03	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r>=2000	0.0660	0.0132	0.0000
mycslope_DCXS	Z00	Categorical of ycslope_r[9] (yield curve slope)	base level: else			
mperiodnbr_DCXS	L02	Categorical of period_number	period_number <= 2	1.6388	0.0844	0.0000
mperiodnbr_DCXS	L03	Categorical of period_number	period_number = 3	0.6355	0.0379	0.0000
mperiodnbr_DCXS	L04	Categorical of period_number	period_number = 4	0.1908	0.0307	0.0000
mperiodnbr_DCXS	Z05	Categorical of period_number	base level: else			
vperiodnbr_DCXS_pw1		Variate piecewise of period_number	median(0,period_number-5,9-5)	-0.0578	0.0053	0.0000
vperiodnbr_DCXS_pw2		Variate piecewise of period_number	median(0,period_number-9,18-9)	0.0080	0.0017	0.0000
vperiodnbr_DCXS_pw3		Variate piecewise of period_number	median(0,period_number-18,36-18)	0.0143	0.0008	0.0000
vperiodnbr_DCXS_pw4		Variate piecewise of period_number	median(0,period_number-36,50-36)	0.0040	0.0010	0.0000
mcredit_DCXS	L01	Categorical of credit_score	credit_score = 0	0.0945	0.0185	0.0000
mcredit_DCXS	L02	Categorical of credit_score	credit_score<525	-0.0356	0.0355	0.3149
mcredit_DCXS	Z00	Categorical of credit_score	base level: else			
vcredit_DCXS_pw1		Variate piecewise of credit_score	median(0,credit_score-525,645-525)	0.0026	0.0002	0.0000
vcredit_DCXS_pw2		Variate piecewise of credit_score	median(0,credit_score-645,800-645)	0.0009	0.0002	0.0000
mdurdefepi_DCXS	L02	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 2	-0.6019	0.0069	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mdurdefepi_DCXS	L03	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 3	-0.9461	0.0086	0.0000
mdurdefepi_DCXS	L04	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 4	-1.2845	0.0108	0.0000
mdurdefepi_DCXS	L05	Categorical of dur_def_episode (duration of default episode)	dur_def_episode >= 4	-1.4205	0.0119	0.0000
mdurdefepi_DCXS	Z01	Categorical of dur_def_episode (duration of default episode)	base level: dur_def_episode <=1			
vdurdefepi_DCXS_pw1		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-5,7-5)	-0.3167	0.0078	0.0000
vdurdefepi_DCXS_pw2		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-7,40-7)	-0.0264	0.0010	0.0000
vdeltaUEinit_DCXS_pw3		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-100,116-100)	-0.0033	0.0005	0.0000
vdeltaUEinit_DCXS_pw4		Variate piecewise of DeltaUEInit_r^4 (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-116,218-116)	-0.0007	0.0001	0.0000
mRatioTmpTei_DCXS	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	-0.2495	0.0208	0.0000
mRatioTmpTei_DCXS	Z00	Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_DCXS_pw1		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,24-0)	-0.0122	0.0009	0.0000
vratiotmptei_DCXS_pw2		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-24,36-24)	-0.0074	0.0008	0.0000
mpriordef_DCXS	L01	Categorical of prior_default_cnt	prior_default_cnt = 1	-0.0647	0.0077	0.0000
mpriordef_DCXS	L02	Categorical of prior_default_cnt	prior_default_cnt = 2	-0.1240	0.0091	0.0000
mpriordef_DCXS	L03	Categorical of prior_default_cnt	3 <= prior_default_cnt <= 8	-0.1902	0.0085	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
mpriordef_DCXS	L04	Categorical of prior_default_cnt	9 <= prior_default_cnt <= 13	-0.1972	0.0151	0.0000
mpriordef_DCXS	L05	Categorical of prior_default_cnt	prior_default_cnt >= 14	-0.1524	0.0313	0.0000
mpriordef_DCXS	Z00	Categorical of prior_default_cnt	base level: 0			
vsato_DCXS_pw2		Variate piecewise of sato (spread at origination)	median(sato-(-.1),0,.7-(-.1))	-0.0635	0.0347	0.0671
vloanraw_DCXS_pw1		Variate piecewise of loansize_raw	median(30000,loansize_raw,143000)	0.0000	0.0000	0.0000
vloanraw_DCXS_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-143000,200000-143000)	0.0000	0.0000	0.0000
vloanraw_DCXS_pw3		Variate piecewise of loansize_raw	median(0,loansize_raw-200000,425000-200000)	0.0000	0.0000	0.0049
vdeltaUEpr3_DCXS_pw3		Variate piecewise of deltaueprr3_r[5] (change in unemployment from 3 quarters prior)	median(deltaueprr3_r-10,0,200-10)	-0.0011	0.0002	0.0000
vdeltaUEBlended_DCXS_pw3		Variate piecewise of ue_blended_r[8] (change in unemployment rate)	delta_ue_blended - .1	-0.0385	0.0127	0.0024
mltv_DCXS	L01	Categorical of ltv_i_r[7] (loan-to-value)	ltv_i_r = .	0.2799	0.0336	0.0000
mltv_DCXS	Z00	Categorical of ltv_i_r[7] (loan-to-value)	base level: else			
vltv_DCXS_pw1		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-0,68-0)	-0.0037	0.0006	0.0000
vltv_DCXS_pw2		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-68,81-68)	-0.0106	0.0010	0.0000
vltv_DCXS_pw3		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-81,91-81)	-0.0090	0.0013	0.0000
vltv_DCXS_pw4		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-91,100-91)	-0.0409	0.0035	0.0000
vhpa2yb_DCXS_pw1		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-85,98-85)	0.0075	0.0010	0.0000
vhpa2yb_DCXS_pw3		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-108,117-108)	0.0103	0.0011	0.0000
vhpa2yb_DCXS_pw4		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-117,130-117)	0.0072	0.0012	0.0000
vhpa2yb_DCXS_pw5		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-130,180-130)	0.0108	0.0012	0.0000
vprior3uest_DCXS_pw1		Variate piecewise of	median(2.5,prior3_ue_sa_st,5)	-0.0291	0.0070	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		prior3_ue_sa_st (change in prior-3 seasonally adjusted unemployment rate)				
vprior3uest_DCXS_pw2		Variate piecewise of prior3_ue_sa_st (change in prior-3 seasonally adjusted unemployment rate)	median(0,prior3_ue_sa_st-5,12.1-5)	-0.0312	0.0027	0.0000
mDeltaTY10_DCXS	L01	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r < 53	-0.0139	0.0085	0.0997
mDeltaTY10_DCXS	Z00	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	base level: else			
vDeltaTY1_DCXS_pw2		Variate piecewise of DeltaTy1Init_r^3 (change in 1-year Treasury rate from policy inception to current)	median(0,DeltaTy1Init_R-22,80-22)	0.0010	0.0002	0.0000
vDeltaTY1_DCXS_pw3		Variate piecewise of DeltaTy1Init_r^3 (change in 1-year Treasury rate from policy inception to current)	median(0,DeltaTy1Init_R-80,150-80)	0.0010	0.0002	0.0000
mseason_grp_DCXS	L02	Categorical of season	season = "spring"	0.1581	0.0061	0.0000
mseason_grp_DCXS	L03	Categorical of season	season = "summer"	-0.0033	0.0065	0.6100
mseason_grp_DCXS	Z0104	Categorical of season	base level: else			
vCCI_DCXS_pw2		Variate piecewise of consumer confidence index	median(0,CCI_r-30,75-30)	0.0125	0.0005	0.0000
vCCI_DCXS_pw3		Variate piecewise of consumer confidence index	median(0,CCI_r-75,110-75)	0.0206	0.0010	0.0000
vSBOI_DCXS_pw1		Variate piecewise of small business optimism index	median(0,CCI_r-110,134-110)	-0.0281	0.0019	0.0000
vSBOI_DCXS_pw2		Variate piecewise of small business optimism index	median(0,SBOI_r-95,100-95)	-0.0764	0.0028	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vSBOI_DCXS_pw3		Variate piecewise of small business optimism index	median(0,SBOI_r-100,108-100)	-0.0345	0.0029	0.0000

Default Transition Model Parameters – ARM D_END

The model parameters for the ARM default to end transition are shown below.

Table 60: Default to End Transition ARM Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				-3.3900	0.2295	0.0000
mjudicial	1	Categorical of judicial (judicial state)	judicial = 1 , judicial state	-0.1731	0.0141	0.0000
mjudicial	2	Categorical of judicial (judicial state)	base level: else, non-judicial state			
mdpa	1	Categorical of dpa (down payment assistance)	dpa = "govt"	-0.4795	0.0978	0.0000
mdpa	2	Categorical of dpa (down payment assistance)	dpa= "nonprof"	-0.4808	0.0319	0.0000
mdpa	3	Categorical of dpa (down payment assistance)	dpa = "relative"	0.0594	0.0209	0.0046
mdpa	4	Categorical of dpa (down payment assistance)	base level: else			
mfrst_tm_by	1	Categorical of frst_tm_by (first-time buyer)	frst_tm_by = "Y"	-0.0304	0.0163	0.0627
mfrst_tm_by	2	Categorical of frst_tm_by (first-time buyer)	base level: else			
mycslope_DEND	L01	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r<=111	0.2621	0.0241	0.0000
mycslope_DEND	L02	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r>=875	-0.7216	0.0381	0.0000
mycslope_DEND	L03	Categorical of ycslope_r[9] (yield curve slope)	ycslope_r>=2000	-0.7899	0.0454	0.0000
mycslope_DEND	Z00	Categorical of ycslope_r[9] (yield curve slope)	base level: else			
vperiodnbr_DEND_pw2		Variate piecewise of period_number	median(0,period_number-9,18-9)	0.0192	0.0039	0.0000
vperiodnbr_DEND_pw3		Variate piecewise of period_number	median(0,period_number-18,36-18)	0.0166	0.0019	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vperiodnbr_DEND_pw4		Variate piecewise of period_number	median(0,period_number-36,50-36)	0.0073	0.0024	0.0023
vperiodnbr_DEND_pw5		Variate piecewise of period_number	median(0,period_number-50,70-50)	0.0196	0.0028	0.0000
mcredit_DEND	L01	Categorical of credit_score	credit_score = 0	0.3355	0.0678	0.0000
mcredit_DEND	L02	Categorical of credit_score	credit_score<525	0.0678	0.1288	0.5989
mcredit_DEND	Z00	Categorical of credit_score	base level: else			
vcredit_DEND_pw1		Variate piecewise of credit_score	median(0,credit_score-525,645-525)	0.0027	0.0007	0.0000
vcredit_DEND_pw2		Variate piecewise of credit_score	median(0,credit_score-645,800-645)	0.0038	0.0005	0.0000
mdurdefepi_DEND	L02	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 2	-0.3630	0.0199	0.0000
mdurdefepi_DEND	L03	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 3	-0.5837	0.0239	0.0000
mdurdefepi_DEND	L04	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 4	-0.6907	0.0275	0.0000
mdurdefepi_DEND	L05	Categorical of dur_def_episode (duration of default episode)	dur_def_episode >= 4	-0.7964	0.0293	0.0000
mdurdefepi_DEND	Z01	Categorical of dur_def_episode (duration of default episode)	base level: dur_def_episode <=1			
vdurdefepi_DEND_pw1		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-5,7-5)	-0.1005	0.0175	0.0000
vdurdefepi_DEND_pw2		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-7,24-7)	-0.0161	0.0025	0.0000
vdurdefepi_DEND_pw3		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-24,40-24)	-0.0229	0.0050	0.0000
vdeltaUEinit_DEND_pw1		Variate piecewise of DeltaUEInit_r[4] (change in unemployment rate from policy inception to current)	median(0,DeltaUEInit_r-0,63-0)	0.0039	0.0020	0.0506
vdeltaUEinit_DEND_pw2		Variate piecewise of DeltaUEInit_r[4]	median(0,DeltaUEInit_r-63,100-63)	0.0054	0.0007	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
		(change in unemployment rate from policy inception to current)				
mRatioTmpTei_DEND	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	-0.3578	0.0504	0.0000
mRatioTmpTei_DEND	Z00	Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
vratiotmptei_DEND_pw1		Variate piecewise of ratio_tmp_tei (front-end ratio)	median(0,ratio_tmp_tei-0,24-0)	-0.0092	0.0021	0.0000
mpriordef_DEND	L01	Categorical of prior_default_cnt	prior_default_cnt = 1	-0.1777	0.0171	0.0000
mpriordef_DEND	L02	Categorical of prior_default_cnt	prior_default_cnt = 2	-0.3106	0.0223	0.0000
mpriordef_DEND	L03	Categorical of prior_default_cnt	3 <= prior_default_cnt <= 8	-0.6791	0.0237	0.0000
mpriordef_DEND	L04	Categorical of prior_default_cnt	9 <= prior_default_cnt <= 13	-1.3108	0.0581	0.0000
mpriordef_DEND	L05	Categorical of prior_default_cnt	prior_default_cnt >= 14	-1.3221	0.1227	0.0000
mpriordef_DEND	Z00	Categorical of prior_default_cnt	base level: 0			
vloanraw_DEND_pw1		Variate piecewise of loansize_raw	median(30000,loansize_raw,143000)	0.0000	0.0000	0.0000
vloanraw_DEND_pw3		Variate piecewise of loansize_raw	median(0,loansize_raw-200000,425000-200000)	0.0000	0.0000	0.0000
mltv_DEND	L01	Categorical of ltv_i_r[7] (loan-to-value)	ltv_i_r = .	0.2698	0.0866	0.0018
mltv_DEND	Z00	Categorical of ltv_i_r[7] (loan-to-value)	base level: else			
vltv_DEND_pw1		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-0,68-0)	-0.0182	0.0019	0.0000
vltv_DEND_pw3		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-81,91-81)	-0.0160	0.0028	0.0000
vltv_DEND_pw4		Variate piecewise of ltv_i_r[7] (loan-to-value)	median(0,ltv_i_r-91,100-91)	-0.1033	0.0088	0.0000
vhpa2yb_DEND_pw1		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-85,98-85)	0.0252	0.0044	0.0000
vhpa2yb_DEND_pw2		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-98,108-98)	0.0299	0.0039	0.0000
vhpa2yb_DEND_pw3		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-108,117-108)	0.0701	0.0025	0.0000
vhpa2yb_DEND_pw4		Variate piecewise of hpa2y_blended_r[6]	median(0,hpa2y_blended_r-117,180-117)	0.0307	0.0009	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vUEblend_DEND_pw1		Variate piecewise of ue_blended_r[8] (change in unemployment rate)	median(200,ue_blended_r,450)	-0.0018	0.0002	0.0000
vUEblend_DEND_pw3		Variate piecewise of ue_blended_r[8] (change in unemployment rate)	median(0,ue_blended_r-850,1500-850)	-0.0007	0.0002	0.0000
vdeltaUEpr3_DEND_pw2		Variate piecewise of deltauepr3_r[5] (change in unemployment from 3 quarters prior)	median(deltauepr3_r-(-20),0,10-(-20))	0.0042	0.0006	0.0000
vdeltaUEpr3_DEND_pw3		Variate piecewise of deltauepr3_r[5] (change in unemployment from 3 quarters prior)	median(deltauepr3_r-10,0,200-10)	-0.0008	0.0003	0.0024
mDeltaTY10_DEND	L01	Categorical of DeltaTy10Init_r[2] (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r < 53	-0.2515	0.0323	0.0000
mDeltaTY10_DEND	Z00	Categorical of DeltaTy10Init_r[2] (change in 10-year Treasury rate from policy inception to current)	base level: else			
vDeltaTY1_DEND_pw1		Variate piecewise of DeltaTy1Init_r[3] (change in 1-year Treasury rate from policy inception to current)	median(0,DeltaTy1Init_R-0,22-0)	0.0244	0.0026	0.0000
vDeltaTY1_DEND_pw2		Variate piecewise of DeltaTy1Init_r[3] (change in 1-year Treasury rate from policy inception to current)	median(0,DeltaTy1Init_R-22,80-22)	0.0028	0.0005	0.0000
vDeltaTY1_DEND_pw3		Variate piecewise of DeltaTy1Init_r[3] (change in 1-year Treasury rate from policy inception to current)	median(0,DeltaTy1Init_R-80,150-80)	0.0030	0.0004	0.0000
mseason_grp_DEND	L02	Categorical of season	season = "spring"	0.1355	0.0159	0.0000
mseason_grp_DEND	L03	Categorical of season	season = "summer"	0.1260	0.0161	0.0000
mseason_grp_DEND	Z0104	Categorical of season	base level: else			

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
vCCI_DEND_pw1		Variate piecewise of consumer confidence index	median(0,CCI_r-30,75-30)	0.0058	0.0017	0.0007
vCCI_DEND_pw2		Variate piecewise of consumer confidence index	median(0,CCI_r-75,110-75)	-0.0066	0.0011	0.0000
vCCI_DEND_pw3		Variate piecewise of consumer confidence index	median(0,CCI_r-110,134-110)	-0.0360	0.0024	0.0000
vSBOI_DEND_pw3		Variate piecewise of small business optimism index	median(0,SBOI_r-100,108-100)	0.0587	0.0051	0.0000

Section 3: Model Validation

Model validation was accomplished in part by applying the model structure developed using the training set to the validation dataset. The application of the model to the validation data produces the probability of each type of transition. The actual target variable is then compared to the predicted target variable to ensure the model fits the transition process without over-fitting the actual data.

Specifically, for the final condition transition state, we calculate the actual transition rate and the predicted transition rate. The actual transition is 1 for the final transition state of the record and 0 for all other transition states. The probability of each final transition state for each record in the validation dataset is derived from the model parameters. The sum of all predicted final condition transition states' probabilities is 1 for each record.

Simple quantile plots are then created for each final condition transition state. All records are sorted, or ranked, in increasing order by the predicted probability. Ten equal sized decile groups are created with 10% of the records in each group. The sum of the actual probability and the sum of the predicted probability for each ending condition within each decile is calculated. The total number of actual and predicted transitions are compared for consistency. The objective of a model is to have a significant spread in predicted values while maintaining a close relationship between the resulting actual and predicted values.

The validation charts shown below show that the spread in prediction is consistent between the actual and predicted experience, and also the actual vs. predicted ratio for each decile are consistent as well.

Current FRM30NSR Transition Models

The validation charts by ending condition for the FRM30NSR models are shown below.

Figure 16: Current FRM30NSR Transition Model Validation - Ending Condition Streamlined Refinance

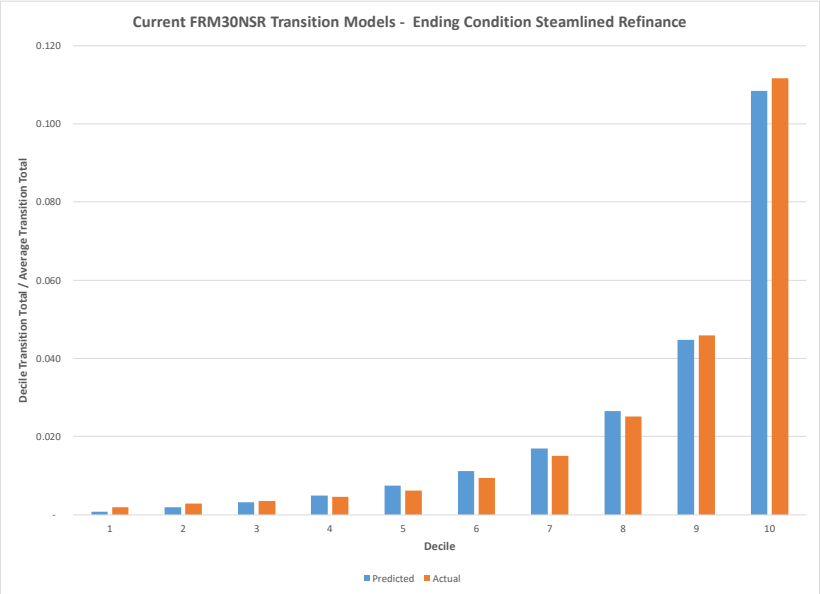


Figure 17: Current FRM30NSR Transition Model Validation - Ending Condition Prepayment

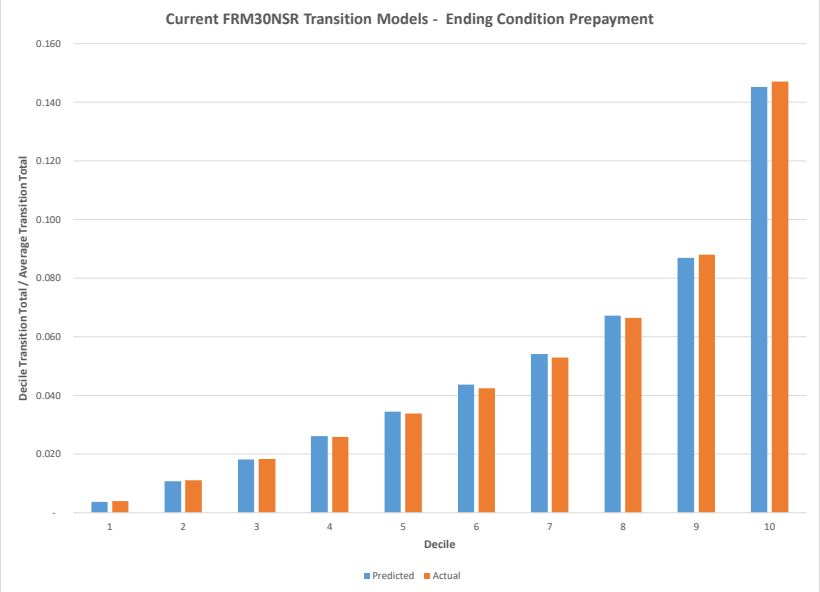


Figure 18: Current FRM30NSR Transition Model Validation - Ending Condition Self-Cure

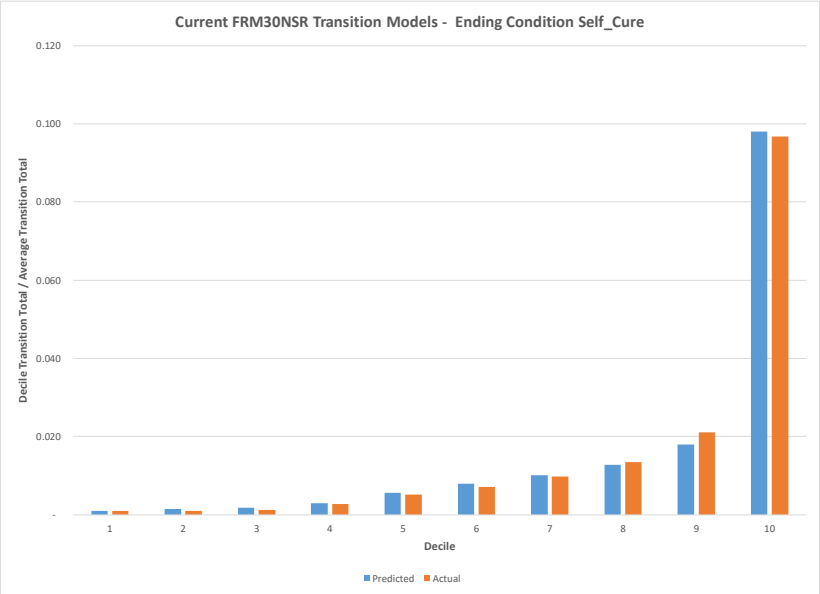
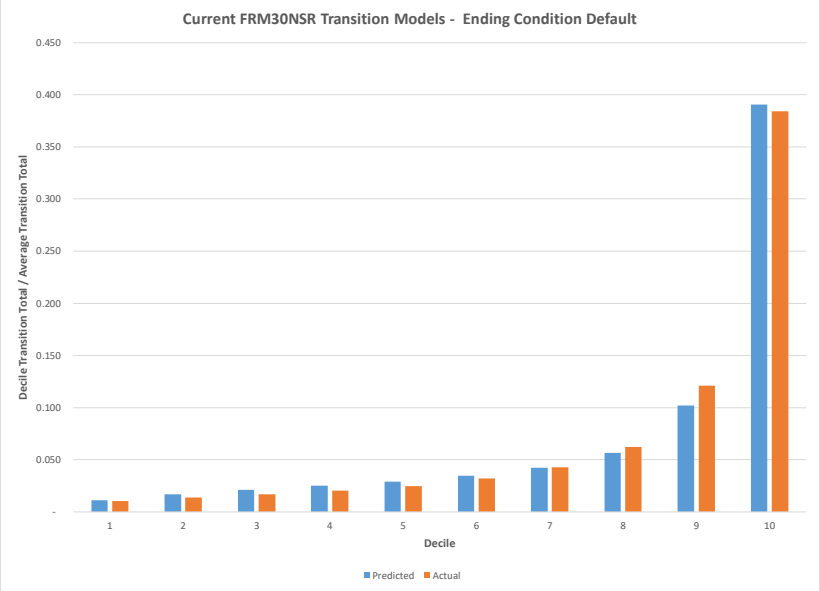


Figure 19: Current FRM30NSR Transition Model Validation - Ending Condition Default



Current FRM30SR Transition Models

The validation charts by ending condition for the FRM30SR models are shown below.

Figure 20: Current FRM30SR Transition Model Validation - Ending Condition Self-Cure

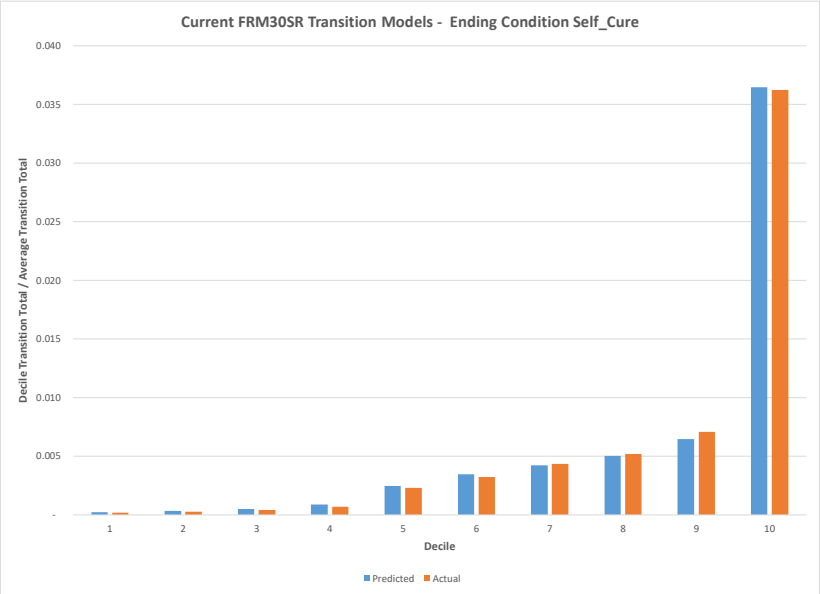


Figure 21: Current FRM30SR Transition Model Validation - Ending Condition Default

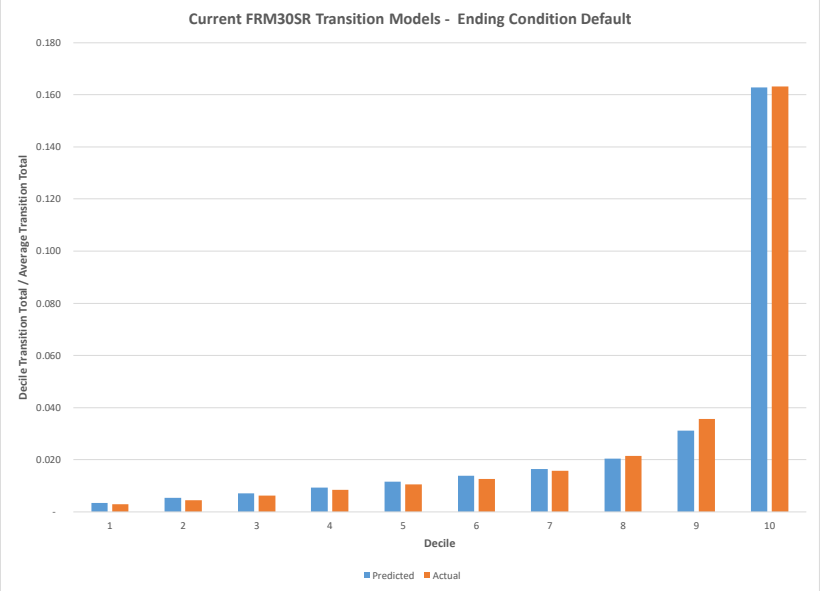
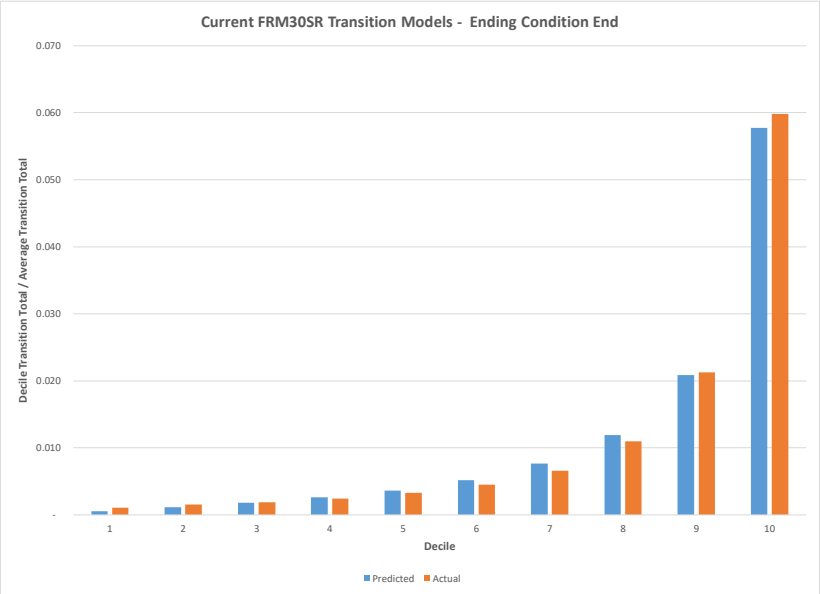


Figure 22: Current FRM30SR Transition Model Validation - Ending Condition End



Current FRM15 Transition Models

The validation charts by ending condition for the FRM15 models are shown below.

Figure 23: Current FRM15 Transition Model Validation - Ending Condition Streamlined Refinance

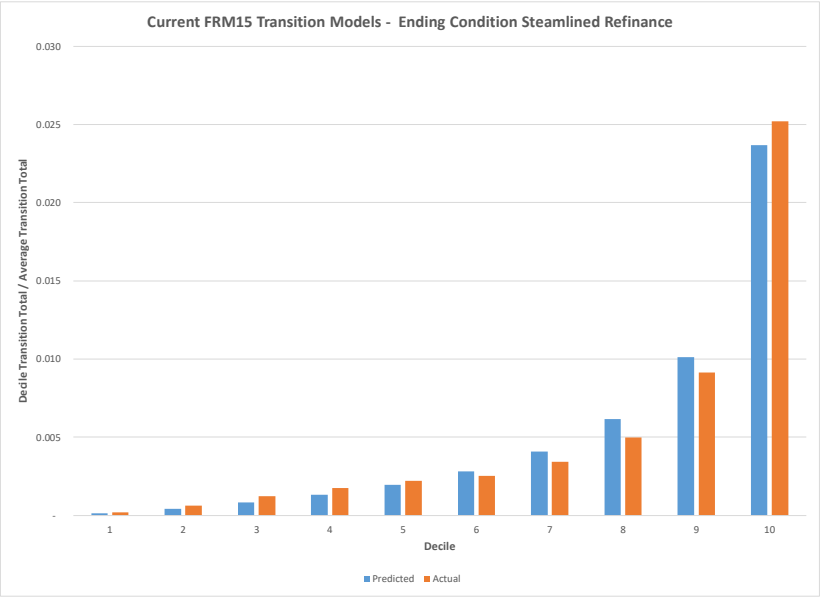


Figure 24: Current FRM15 Transition Model Validation - Ending Condition Default

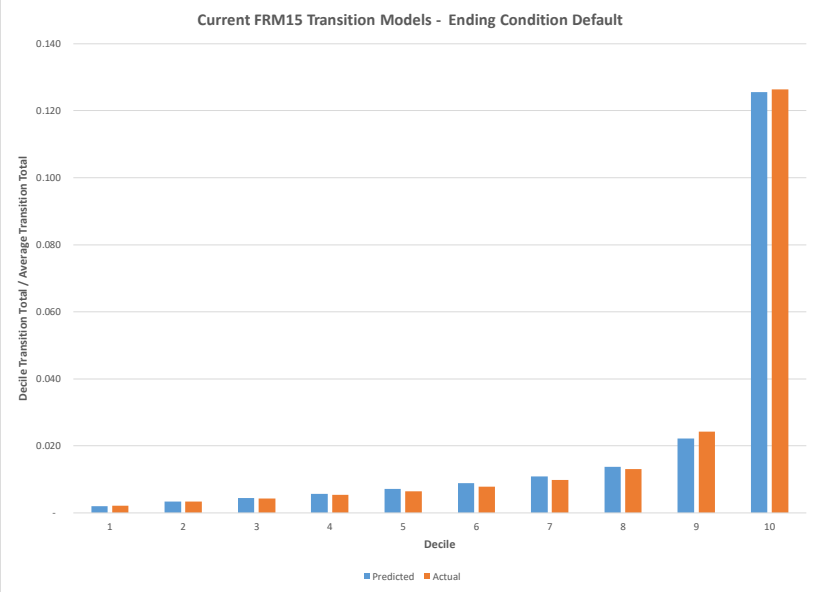


Figure 25: Current FRM15 Transition Model Validation - Ending Condition Self-Cure

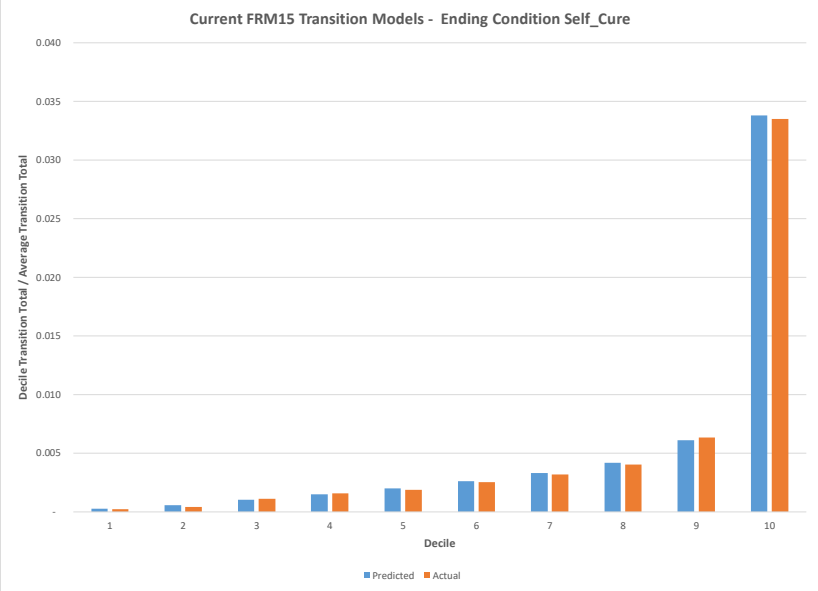
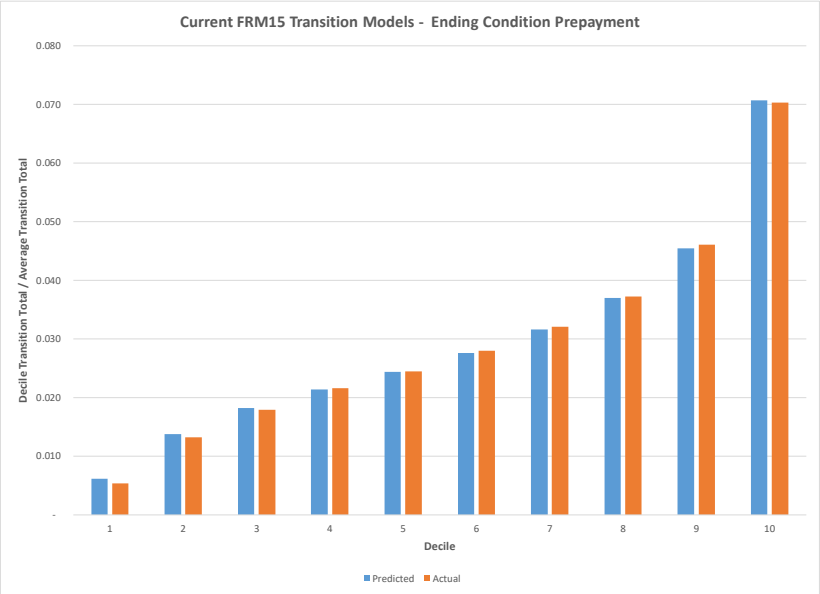


Figure 26: Current FRM15 Transition Model Validation - Ending Condition Prepayment



Current ARM Transition Models

The validation charts by ending condition for the ARM model are shown below.

Figure 27: Current ARM Transition Model Validation - Ending Condition Streamlined Refinance

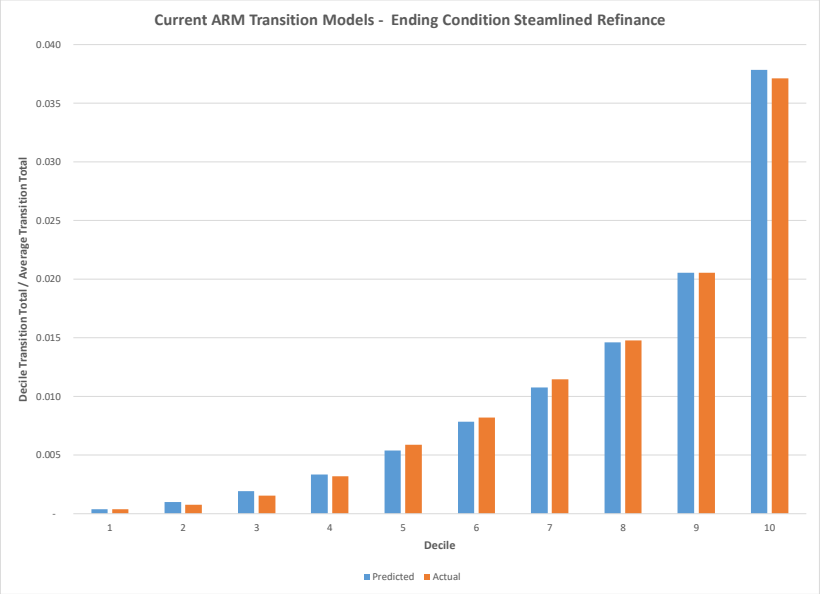


Figure 28: Current ARM Transition Model Validation - Ending Condition Default

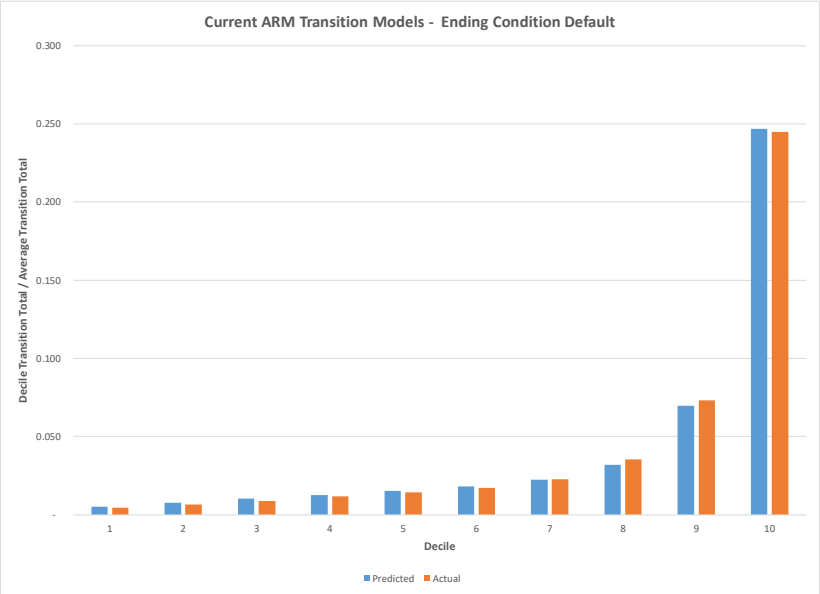


Figure 29: Current ARM Transition Model Validation - Ending Condition Self-Cure

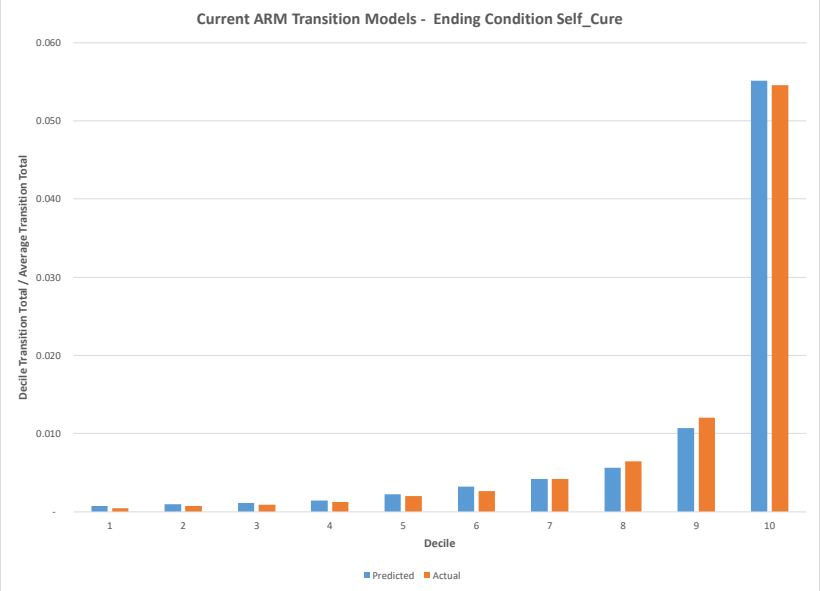
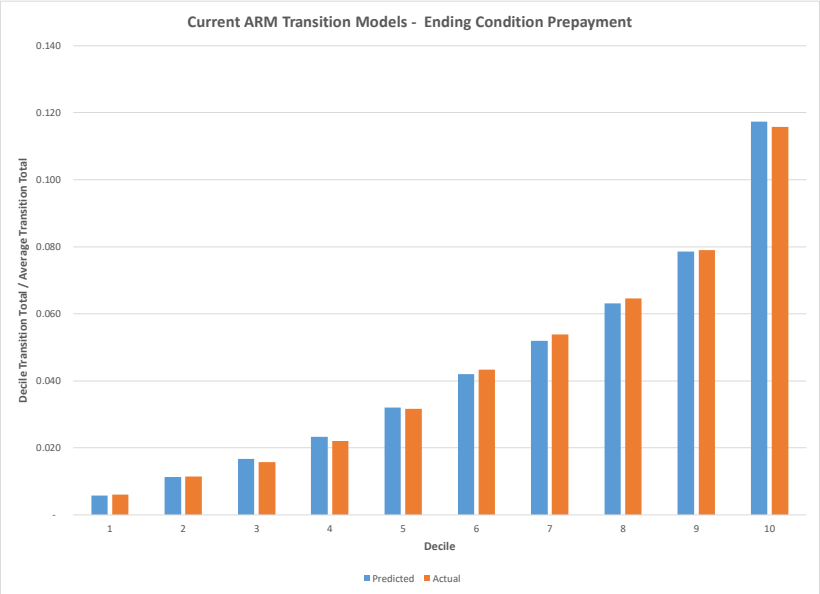


Figure 30: Current ARM Transition Model Validation - Ending Condition Prepayment



Default FRM30NSR Transition Models

The validation charts by ending condition for the FRM30NSR models are shown below.

Figure 31: Default FRM30 Transition Model Validation - Ending Condition Claim

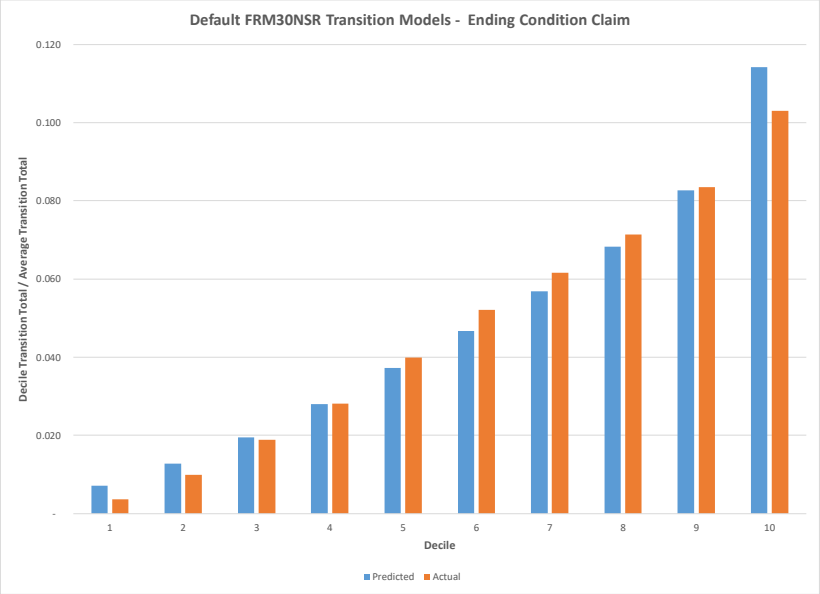


Figure 32: Default FRM30 Transition Model Validation - Ending Condition Cure with Modification

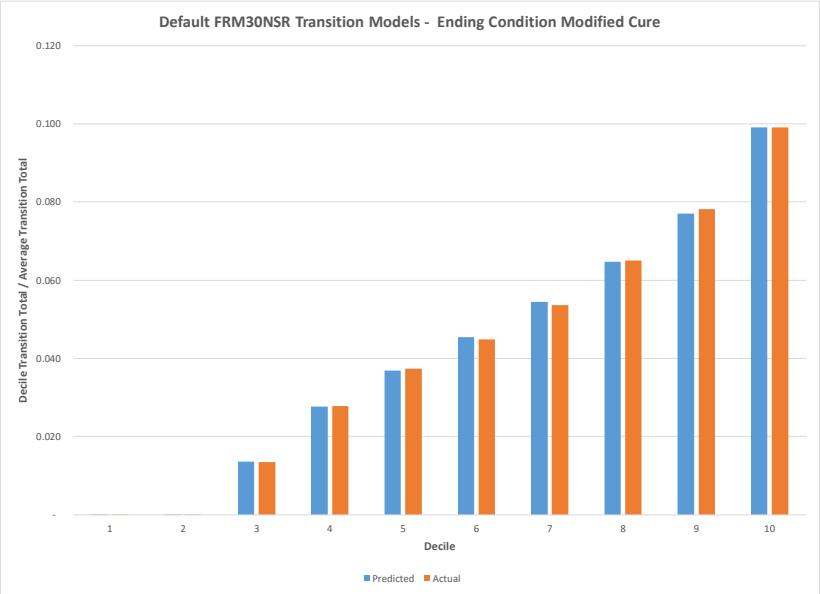


Figure 33: Default FRM30 Transition Model Validation - Ending Condition Self-Cure

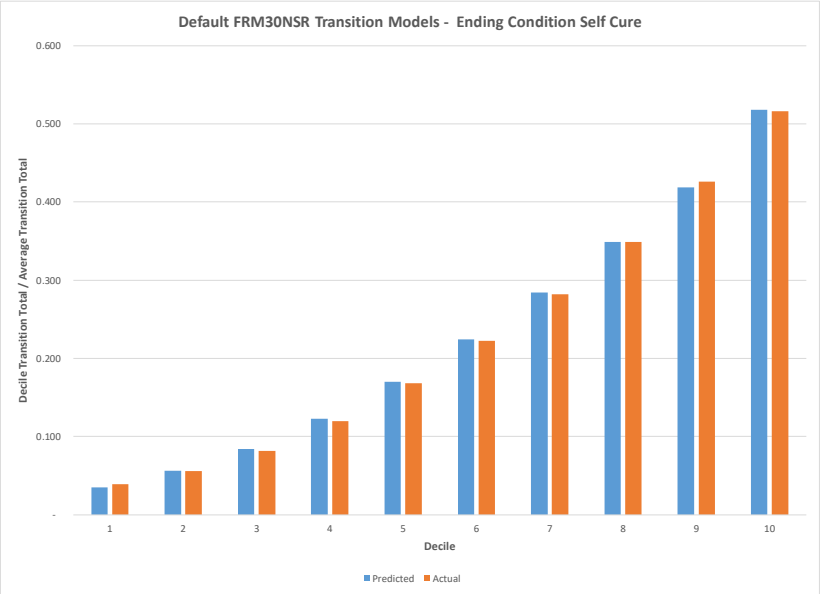
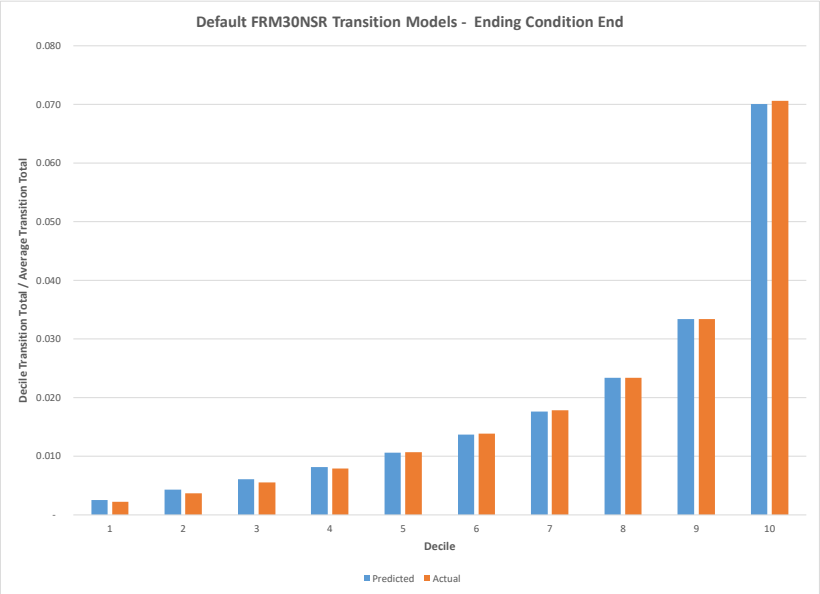


Figure 34: Default FRM30 Transition Model Validation - Ending Condition End



Default FRM30SR Transition Models

The validation charts by ending condition for the FRM30SR models are shown below.

Figure 35: Default FRM30 Transition Model Validation - Ending Condition Claim

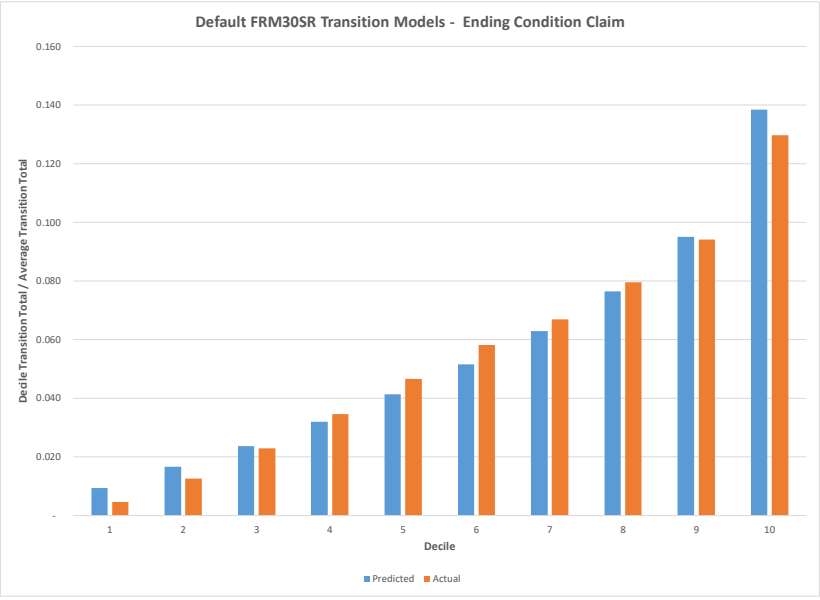


Figure 36: Default FRM30 Transition Model Validation - Ending Condition Cure with Modification

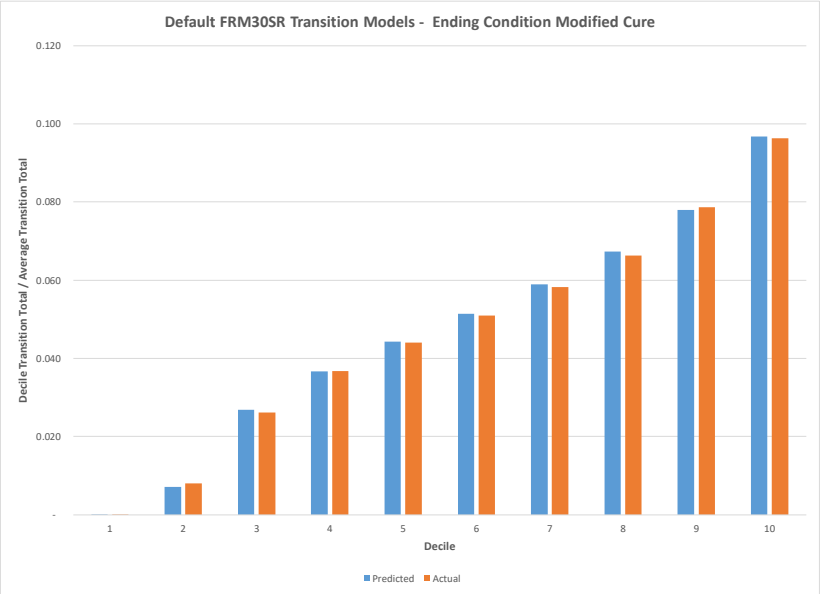


Figure 37: Default FRM30 Transition Model Validation - Ending Condition Self-Cure

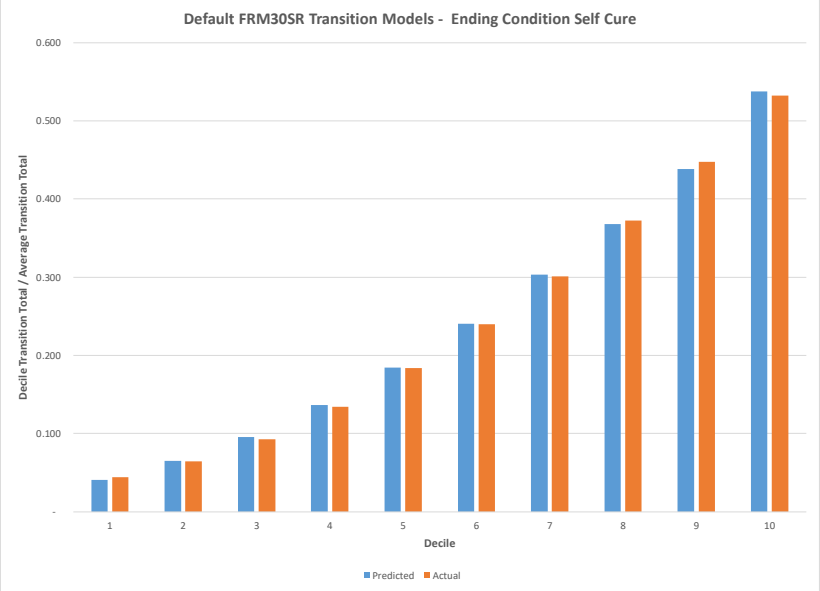


Figure 38: Default FRM30 Transition Model Validation - Ending Condition End

Default FRM15 Transition Models

The validation charts by ending condition for the FRM15 model are shown below.

Figure 39: Default FRM15 Transition Model Validation - Ending Condition Claim

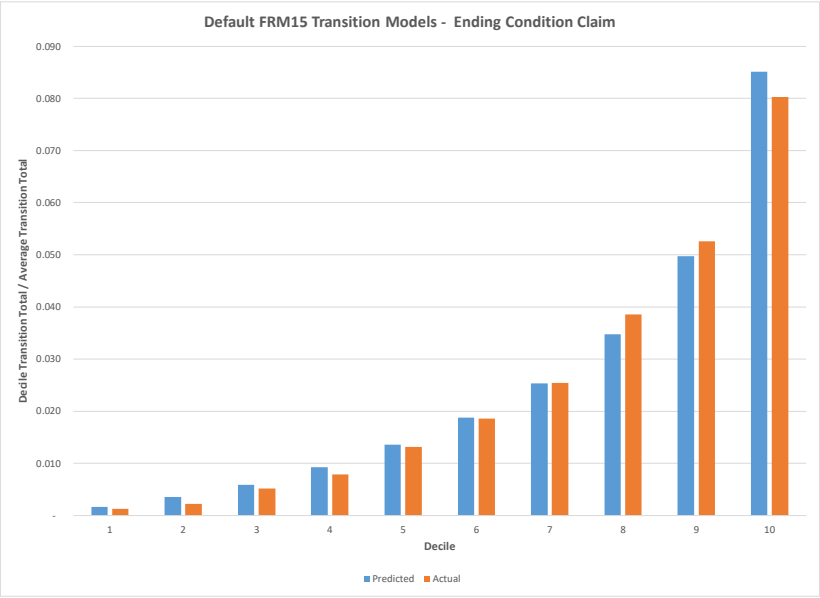


Figure 40: Default FRM15 Transition Model Validation - Ending Condition Cure with Modification

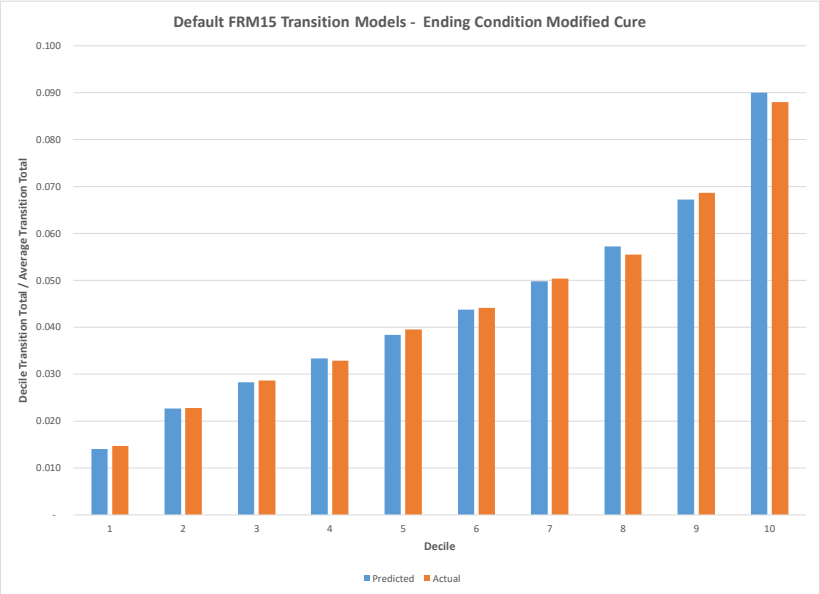


Figure 41: Default FRM15 Transition Model Validation - Ending Condition Self-Cure

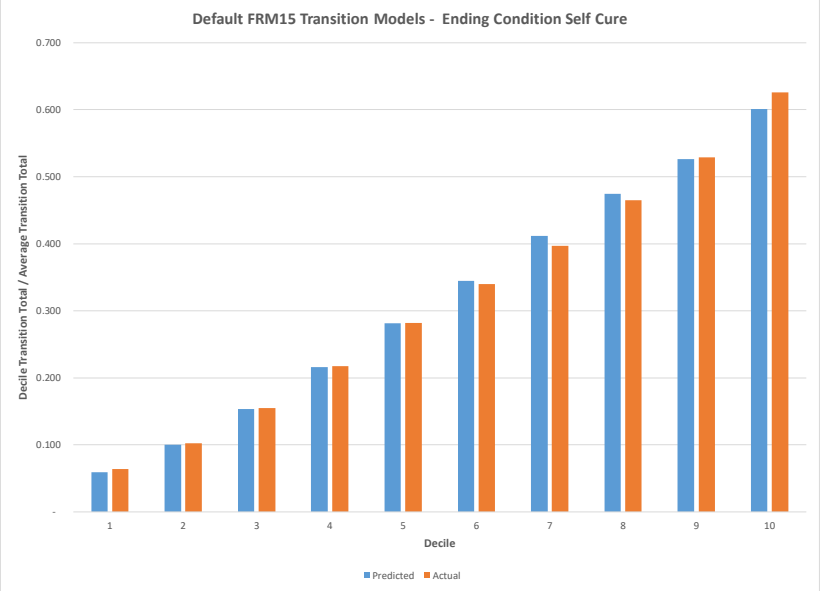
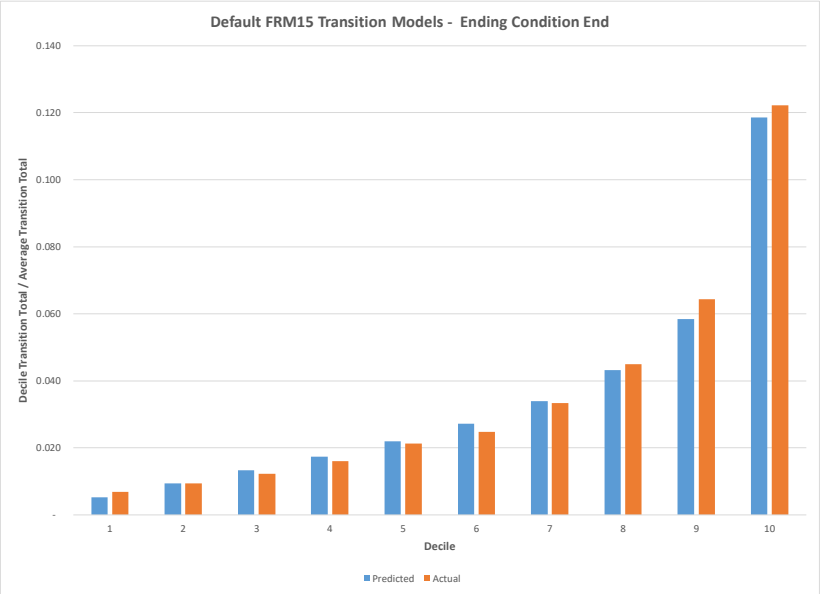


Figure 42: Default FRM15 Transition Model Validation - Ending Condition End



Default ARM Transition Models

The validation charts by ending condition for the ARM models are shown below.

Figure 43: Default ARM Transition Model Validation - Ending Condition Claim

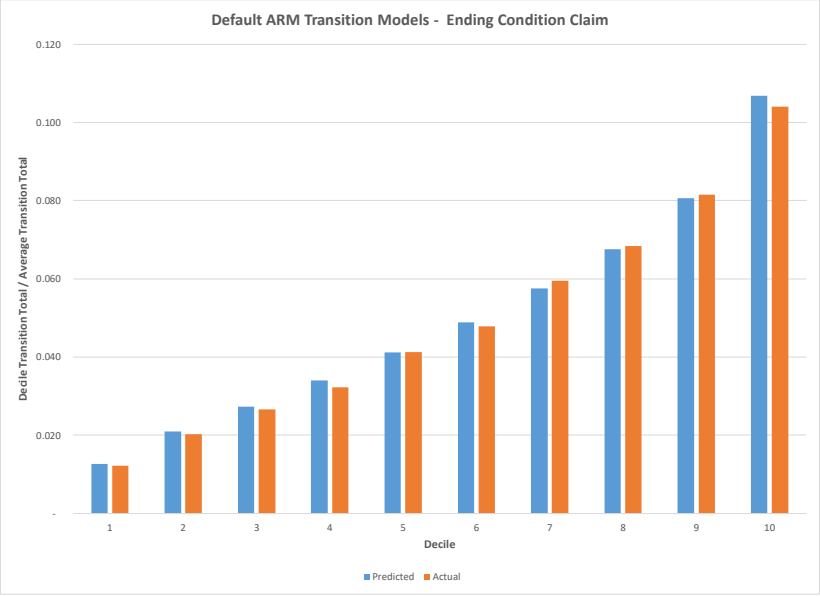


Figure 44: Default ARM Transition Model Validation - Ending Condition Cure with Modification

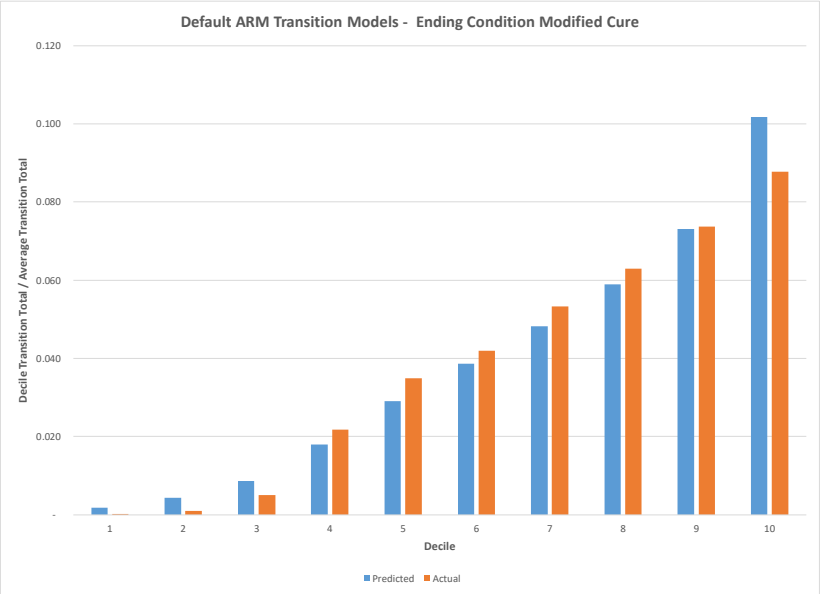


Figure 45: Default ARM Transition Model Validation - Ending Condition Self-Cure

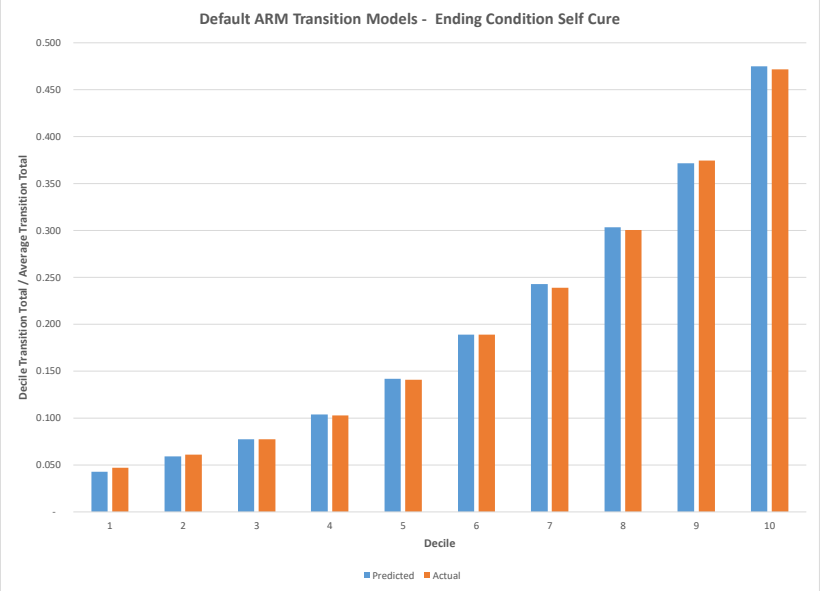
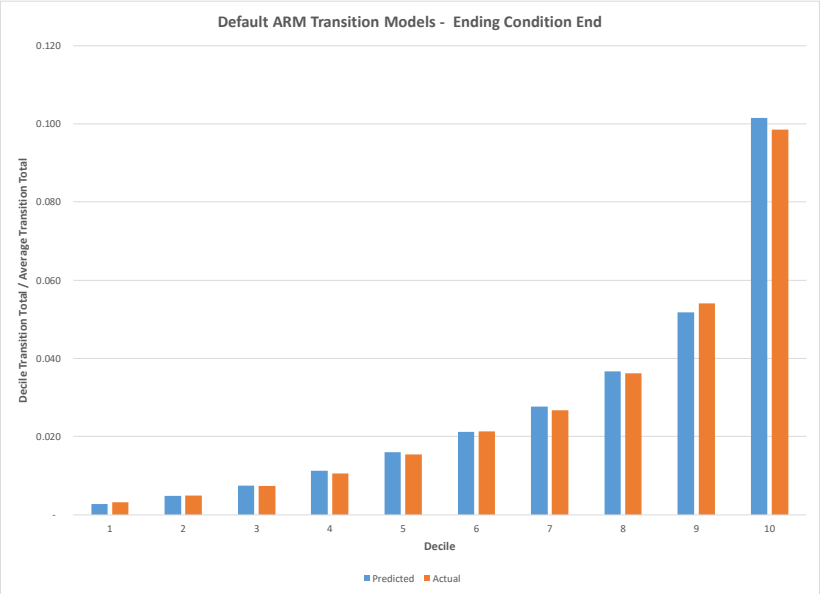


Figure 46: Default ARM Transition Model Validation - Ending Condition End



Appendix C: Loss Severity Models

This appendix describes the loss severity models used in this Actuarial Review. One of the primary sources of variation in the MMI performance has been the loss severity experienced on mortgages that terminate as claims. In the case of a single mortgage, net loss is defined as the difference between the acquisition cost to HUD (acq_cost_to_HUD) from the IDB table and the recoveries realized by FHA on properties owned. We predict the net loss by modeling the probability of the type of claim that develops, then modeling separately the loss for each type of claim and the recovery for real estate owned (REO) claims.

In this appendix, we also summarize the model specifications, describe the explanatory variables used, provide the model parameters and provide validation exhibits for the final models.

Model Specifications

Typically, when an FHA-endorsed mortgage terminates as a claim, the property is conveyed to FHA, and FHA makes a payment to the lender to settle the claim and acquire the underlying property. That is, the underlying house becomes REO. The claim payment FHA makes to the servicer, known as the acquisition cost, consists of three components:

1. the outstanding unpaid principal balance on the mortgage;
2. the foregone interest advanced by the servicer as a result of the mortgage default; and
3. legal and administrative costs paid by the servicer associated with foreclosure, including any expenses associated with the cost of repairing or maintaining the property prior to conveyance.

The formula for acquisition cost is:

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 in achieving homeownership. During the period when the property is held by FHA, but not yet sold, FHA incurs various holding costs associated with maintenance, repairs, tax payments and expenses incurred in preparing the property for sale. Upon sale of the collateral property, FHA receives the sale price less any sales expenses. In sum, the net loss amount is the net amount that FHA cannot recoup from this process:

Net Loss = Acquisition Cost + Holding Cost - Sale Price + Sale Expense

Table 61 shows the distribution of different types of FHA claim terminations. Conveyance refers to the foreclosure procedure discussed above, wherein the property is conveyed to FHA after foreclosure is completed. This is the most common type of claim.

FHA permits pre-foreclosure sales (PFS) as an alternative to the foreclosure process. In the case of a PFS, the property is sold by the borrower 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 of a PFS case is reported as an acquisition cost to FHA. By 2012, the percentage of PFS was just under 24%. Since then, the percentage of PFS has decreased to 7.34%.

There were a significant volume of note (non-performing mortgage) sales from claim Fiscal Year 2003 through claim Fiscal Year 2006. From claim Fiscal Year 2007 to claim Fiscal Year 2012, there were significantly fewer note sales. By 2014, however, the percentage of note sales rose above 27%. In these cases, the expenses of foreclosure procedures and subsequent house sales are avoided by FHA. Note sales are discretionary and highly unpredictable. We do not model note sales as a continuing program.

FHA changed its servicing guide in 2013 to allow foreclosure without conveyance. This consists of a Third Party Sale (TPS) during the foreclosure auction. A third party, instead of FHA, acquires the property directly from the foreclosure auction. This process allows FHA to avoid the process and expenses of property disposition after conveyance including any associated holding costs. TPS' have increased significantly since 2012, accounting for nearly 61% of claims in 2019 and 48% of claims in 2020.

Table 61: Percentage of Claim Termination Types by Fiscal Claim Year

Claim Year	Conveyance (REO)	Note Sales	Third Party Sales (TPS)	Pre Foreclosure Sale (PFS)
1999	94.86%	0.11%	0.00%	5.02%
2000	95.06%	0.09%	0.00%	4.85%
2001	95.03%	0.01%	0.00%	4.97%
2002	94.33%	0.00%	0.00%	5.66%
2003	86.74%	8.34%	0.00%	4.92%
2004	85.57%	8.41%	0.00%	6.02%
2005	83.29%	9.79%	0.00%	6.91%
2006	89.37%	2.83%	0.00%	7.80%
2007	92.80%	0.00%	0.00%	7.20%
2008	93.06%	0.00%	0.10%	6.84%
2009	90.06%	0.00%	0.01%	9.93%
2010	84.46%	0.31%	0.00%	15.22%
2011	76.29%	1.17%	0.02%	22.51%
2012	71.24%	1.32%	3.59%	23.86%
2013	56.72%	17.66%	6.87%	18.74%
2014	42.68%	27.29%	15.40%	14.63%
2015	54.26%	16.27%	18.25%	11.22%
2016	49.54%	11.51%	29.28%	9.66%
2017	38.14%	6.24%	46.96%	8.66%
2018	34.42%	0.11%	56.30%	9.17%
2019	30.92%	0.13%	60.84%	8.10%
2020	44.36%	0.00%	48.30%	7.34%

Table 62 shows the average net loss for the combined foreclosure (REO and TPS) and PFS claims by claim Fiscal Year for 1991 to 2020. The average net loss increased from 1991 to 2012, reaching a high of almost $129,000 in Fiscal Year 2013. Since 2011, the average net loss had been decreasing through 2019, but has increased slightly in 2020.

Table 62: Historical Average Net Loss

Claim Year	Average Net Loss
1991	61,095
1992	62,389
1993	65,614
1994	68,850
1995	71,118
1996	73,864
1997	77,434
1998	81,185
1999	84,226
2000	85,883
2001	87,069
2002	88,206
2003	91,208
2004	93,004
2005	94,310
2006	97,606
2007	101,710
2008	110,001
2009	118,373
2010	127,977
2011	128,833
2012	128,882
2013	124,550
2014	112,660
2015	115,441
2016	107,382
2017	94,977
2018	86,823
2019	79,878
2020	88,631

Net Loss Severity Model Specification

As described above, there are several components of the total loss amount, and each component is influenced by a number of factors. Foregone interest depends on the interest rate on the mortgage and on the length of the default-to-claim lag. Foreclosure expenses can vary depending on whether a judicial foreclosure process is used that can lengthen the time period of the foreclosure process. Repair expenses may be a function of the financial condition of the borrowers, which we proxy by credit scores. Sale prices are influenced by the house price appreciation since origination and by the prevailing local housing market conditions during the default and property disposition periods. Several components of the net loss amount involve expenses that are fixed across foreclosed properties. Hence, mortgages with lower values are more likely to realize higher net losses as a percentage of the sales amount, as the amount of the recovery will be smaller relative to higher value homes.

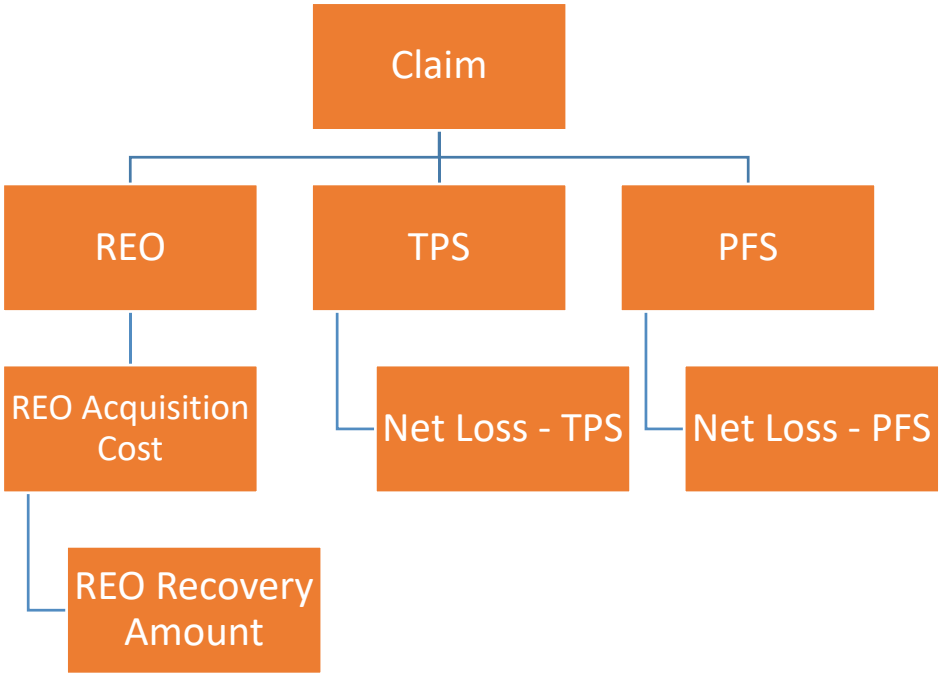
As shown in Table 61, the distribution between REO/TPS (foreclosure) and PFS was relatively stable through Fiscal Year 2009. Beginning in Fiscal Year 2010, there were widespread house price declines and a higher volume of defaults. As a result, the foreclosure claim process had been lengthened and foreclosure claims were delayed,

while the PFS process has remained relatively stable. From Fiscal Year 2009 to 2012, the PFS share increased significantly. Since Fiscal Year 2012, the PFS share has declined. Moreover, the proceeds recovered from REO and PFS sales differ significantly. To achieve more accurate estimates of net loss severities, we adopted a three-stage model:

1. Model to predict the development of an REO, TPS or PFS claims
2. Model of REO acquisition cost and TPS and PFS net loss
3. Model of recovery amount conditional on claim being a foreclosure REO claim

The net loss severity model follows the flowchart in Figure 47.

Figure 47: Net Loss Severity Model Structure



First, we estimate the probability that a claim is settled by the REO, TPS, or PFS process. To model the first-stage choice event, we used a multinomial logistic model approach to estimate the probability of the claim settlement type.

Second, we estimate the REO Acquisition Amount, TPS net loss and PFS net loss as a function of all the same explanatory factors used in the multinomial model. The gross loss severity distribution is smooth and continuous with a long right tail. Thus, we use a GLM approach with a Gamma error structure and a log link function to develop the gross loss severity models. The Gamma structure is used for each loss severity model (REO, TPS, PFS). For REO claims, a recovery model estimating sales proceeds net of the Capital Income Expenses is built using a similar framework.

In addition to the loss severity models described above, we also developed a set of models to project loss mitigation costs. Implemented in 1996, the loss mitigation program was designed as a way to help financially stressed borrowers stay in their homes. Loss mitigation costs can be incurred from modifying the terms of the mortgage, allowing a borrower to refinance into a new mortgage and writing off a portion of the unpaid principal (partial claim), or a forbearance, which is a written agreement with the borrower which includes a plan to reinstate the mortgage. The loss mitigation cost is modeled using a GLM with a Gamma error structure.

Thus, the estimated net loss to the MMI is the expected value of net loss of the different claim types:

$$\text{Net Loss} = Probability\ of\ REO * (\text{GrossLoss}_{REO} - \text{Recovery}) + Probablity\ of\ TPS * \text{NetLoss}_{TPS} + Probablity\ of\ PFS * \text{NetLoss}_{PFS} + Probability\ of\ Loss\ Mitigation * \text{Net Loss Mitigation Cost}$$

Estimation Sample

The sample used to estimate the loss severity model consists of mortgage level data from the FHA single-family data warehouse. The available data covers the period from the first quarter of Fiscal Year 1975 to the third quarter of Fiscal Year 2020. In total, there are over 2.9 million claims in the FHA database.

The models were built using a traditional train/validate approach. A random sample of the data is used to train the models, and the remaining data is used to validate and refine the model parameters and to determine inclusion and exclusion of explanatory variables.

Explanatory Variables

Multiple categories of explanatory variables were used.

- Fixed initial mortgage characteristics: ARM adjustment period, mortgage product, interest rate, initial mortgage size, spread at origination
- Fixed initial borrower characteristics: down payment assistance, first time home buyer, credit score
- Property characteristics: the number of living units, initial home values
- Dynamic variables based on mortgage information: prior default indicator, prior mortgage modification, LTV ratio, interest rate spread, TEI, age of mortgage
- Dynamic variables derived by combining mortgage information and external economic data: spread, spread at origination
- Dynamic macroeconomic variables: 10-year average unemployment rate, change in the unemployment rate, prior year unemployment rate, HPI, state unemployment rate relative to countrywide unemployment rate, CMT rates, state unemployment rate
- Geographic variables: judicial state, collateral state

Most of the explanatory variables used in the loss severity model are the same as those used in the mortgage status transition models. The additional variables used in the loss severity models are defined below.

- **Product**: loan product type. This variable is incorporated as a categorical variable.

- **Balance**: outstanding mortgage balance. This variable is incorporated as a variate.
- **Deltatm3**: change in three-month CMT rate from policy inception to current. This variable is incorporated as a grouped categorical variable.
- **Arm_ind**: ARM product type indicator. This variable is incorporated as a grouped categorical variable.

Model Parameters

Loss Mitigation Binomial Model

The model parameters for the binomial model to estimate whether a claim is a loss mitigation (HAMP) claim are below.

Table 63: Loss Mitigation Binomial Model Parameters

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				0.0675	0.6113	0.9121
SVSBOI_pw1		Small Business Optimism Index	median(0,SBOI-80,95-80)	-0.0053	0.0121	0.6628
SVSBOI_pw2		Small Business Optimism Index	median(0,SBOI-95,110-95)	-0.0352	0.0015	0.0000
SMproduct	ARM	Categorical of product type	adjustable rate mortgage	0.2769	0.0411	0.0000
SMproduct	ARMSR	Categorical of product type	adjustable rate mortgage - streamline refinance	0.1271	0.0658	0.0534
SMproduct	FRM15	Categorical of product type	15 year fixed rate mortgage	-1.1966	0.0496	0.0000
SMproduct	FRM15SR	Categorical of product type	15 year fixed rate mortgage - streamline refinance	-1.1723	0.0961	0.0000
SMproduct	FRM30SR	Categorical of product type	30 year fixed rate mortgage - streamline refinance	-0.1576	0.0292	0.0000
SMproduct	z_FRM30	Categorical of product type	30 year fixed rate mortgage			
SVloansize_raw_grp		Variate version of loansize_raw	min(loansize/1000,600)	0.0023	0.0001	0.0000
SMpriordef	L01	Categorical of prior defaults	prior_default_count = 1	-0.1139	0.0148	0.0000
SMpriordef	L02	Categorical of prior defaults	prior_default_count = 2	-0.2435	0.0165	0.0000
SMpriordef	L03	Categorical of prior defaults	prior_default_count >= 3	-0.3930	0.0161	0.0000
SMpriordef	Z00	Categorical of prior defaults	prior_default_count = 0			
SMpriormod	L01	Categorical of Prior Loan Modifications	prior_mod_cnt = 1	0.1361	0.0127	0.0000
SMpriormod	L02	Categorical of Prior Loan Modifications	prior_mod_cnt = 2	0.2197	0.0189	0.0000
SMpriormod	L03	Categorical of Prior Loan Modifications	prior_mod_cnt >= 3	0.3384	0.0256	0.0000
SMpriormod	Z00	Categorical of Prior Loan Modifications	prior_mod_cnt = 0			

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
SVpriordef_pw1		Variate piecewise version of prior defaults	min(prior_default_cnt,15)-3	-0.1434	0.0383	0.0002
SVpriormod_pw1		Variate piecewise version of prior_mod_cnt	median(0,prior_mod_cnt-3,15-3)	-0.0778	0.0189	0.0000
SMseason	L01	Categorical of season	season = "winter"	-0.1075	0.0137	0.0000
SMseason	L02	Categorical of season	season = "spring"	-0.0870	0.0130	0.0000
SMseason	L03	Categorical of season	season = "summer"	-0.1529	0.0128	0.0000
SMseason	Z04	Categorical of season	season = "fall"			
SMperiodnbr_LML	L01_04	Categorical of period number	1 <= period_number <= 4	-3.8880	0.2845	0.0000
SMperiodnbr_LML	L05	Categorical of period number	period_number = 5	-2.2790	0.1348	0.0000
SMperiodnbr_LML	L06	Categorical of period number	period_number = 6	-1.1753	0.0726	0.0000
SMperiodnbr_LML	L07	Categorical of period number	period_number = 7	-0.2839	0.0392	0.0000
SMperiodnbr_LML	Z00	Categorical of period number	base level: else			
SVperiodnbr_pw1		Variate piecewise version of period number	median(0,period_number-8,40-8)	-0.0389	0.0007	0.0000
SVperiodnbr_pw2		Variate piecewise version of period number	median(0,period_number-40,53-40)	-0.0144	0.0020	0.0000
SVperiodnbr_pw3		Variate piecewise version of period number	median(0,period_number-53,68-53)	-0.0098	0.0025	0.0000
SVperiodnbr_pw4		Variate piecewise version of period number	median(0,period_number-68,108-68)	-0.0116	0.0019	0.0000
SMjudicial	L01	Categorical of judicial (judicial state)	judicial = 1	-0.0456	0.0097	0.0000
SMjudicial	Z00	Categorical of judicial (judicial state)	base level: else			
SMRatioTmpTei	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	1.1367	0.0491	0.0000
SMRatioTmpTei	Z01	Categorical of ratio_tmp_tei (front-end ratio)	base level: else			
SVratiotmptei_pw1		Variate piecewise version of front end ratio	median(0,ratio_tmp_tei-0,24-0)	0.0331	0.0020	0.0000
SVratiotmptei_pw2		Variate piecewise version of front end ratio	median(0,ratio_tmp_tei-24,36-24)	0.0739	0.0014	0.0000
SVratiotmptei_pw3		Variate piecewise version of front end ratio	max(0,ratio_tmp_tei-36)	0.0219	0.0027	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
SVsato_pw1		Spread at origination	min(sato+0.1,0)	-0.0922	0.0234	0.0000
SVsato_pw2		Spread at origination	median(0,sato+0.1,0.7+0.1)	-0.2187	0.0191	0.0000
SVsato_pw3		Spread at origination	max(0,sato-0.7)	-0.0890	0.0341	0.0091
SVhpa2yb_pw1		Variate piecewise of hpa2y_blended_r[1]	min(hpa2y_blended_r,85)	-0.0004	0.0070	0.9545
SVhpa2yb_pw2		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-85,95-85)	-0.0199	0.0110	0.0698
SVhpa2yb_pw3		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-95,113-95)	-0.0143	0.0017	0.0000
SVhpa2yb_pw4		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-113,120-113)	0.0262	0.0028	0.0000
SVhpa2yb_pw5		Variate piecewise of hpa2y_blended_r[1]	max(0,hpa2y_blended_r-120)	0.0160	0.0048	0.0008
SMdurdefepi	L02	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 2	0.3897	0.0156	0.0000
SMdurdefepi	L03	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 3	0.5205	0.0166	0.0000
SMdurdefepi	L04	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 4	0.5380	0.0178	0.0000
SMdurdefepi	L05	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 5	0.5896	0.0196	0.0000
SMdurdefepi	L06	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 6	0.6549	0.0218	0.0000
SMdurdefepi	L07	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 7	0.6419	0.0239	0.0000
SMdurdefepi	L08	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 8	0.6556	0.0265	0.0000
SMdurdefepi	L09	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 9	0.7112	0.0299	0.0000
SMdurdefepi	L10	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 10	0.7537	0.0341	0.0000

Variable	ClassVal0	Description	Description Detail	Estimate	StdErr	ProbChiSq
SMdurdefepi	L11	Categorical of dur_def_episode (duration of default episode)	dur_def_episode >= 11	0.7527	0.0266	0.0000
SMdurdefepi	Z01	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 1			
SVdurdefepi_pw1		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-10,30-10)	0.0149	0.0030	0.0000
SVdurdefepi_pw2		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-30,40-30)	0.0178	0.0140	0.2044
SMDeltaTm3	L01	Categorical of DeltaTm3Init_r^2 (change in 3-month Treasury rate from policy inception to current)	DeltaTm3Init_r > 600	-0.1244	0.0133	0.0000
SMDeltaTm3	Z00	Categorical of DeltaTm3Init_r^2 (change in 3-month Treasury rate from policy inception to current)	base level: else			
SMcredit	L01	Credit Score	credit_score = 0	0.0288	0.0352	0.4135
SMcredit	L02	Credit Score	credit_score<500	-0.1631	0.0772	0.0347
SMcredit	Z00	Credit Score	base level: else			
SVcredit_pw1		Variate piecewise of Credit Score	median(0,credit_score-500,625-500)	-0.0024	0.0003	0.0000
SVcredit_pw2		Variate piecewise of Credit Score	median(0,credit_score-625,680-625)	0.0017	0.0003	0.0000
SVcredit_pw3		Variate piecewise of Credit Score	max(0,credit_score - 680)	0.0009	0.00	0.0196

Loss Mitigation HAMP Severity Model

The model parameters for the HAMP claim severity model are shown below.

Table 64: Loss Mitigation HAMP Severity Model Parameters

Variable	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				5.7784	0.0609	0.0000
SVbalance_i_log		Variate version of log transformed	log(balance_i/1000)	0.9589	0.0037	0.0000

Variable	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
		outstanding balance at start of quarter				
SVCCI_pw1		Consumer Confidence Index	median(0,CCI-30,91)	-0.0065	0.0009	0.0000
SVCCI_pw2		Consumer Confidence Index	median(0,CCI-91,142-91)	0.0080	0.0007	0.0000
SMproduct	ARM	Categorical of product type	adjustable rate mortgage	0.0690	0.0142	0.0000
SMproduct	ARMSR	Categorical of product type	adjustable rate mortgage - streamline refinance	-0.0136	0.0254	0.5908
SMproduct	FRM15	Categorical of product type	15 year fixed rate mortgage	0.1802	0.0273	0.0000
SMproduct	FRM15SR	Categorical of product type	15 year fixed rate mortgage - streamline refinance	0.5436	0.0532	0.0000
SMproduct	FRM30SR	Categorical of product type	30 year fixed rate mortgage - streamline refinance	-0.0602	0.0120	0.0000
SMproduct	z_FRM30	Categorical of product type	30 year fixed rate mortgage	0.0000	0.0000	.
SMpriormod	L01	Categorical of Prior Loan Modifications	prior_mod_cnt = 1	-0.0916	0.0051	0.0000
SMpriormod	L02	Categorical of Prior Loan Modifications	prior_mod_cnt = 2	-0.0775	0.0081	0.0000
SMpriormod	L03	Categorical of Prior Loan Modifications	prior_mod_cnt >= 3	-0.0742	0.0116	0.0000
SMpriormod	Z00	Categorical of Prior Loan Modifications	prior_mod_cnt = 0	0.0000	0.0000	.
SVpriormod_pw1		Variate piecewise version of prior_mod_cnt	median(0,prior_mod_cnt-3,15-3)	-0.0159	0.0100	0.11
SMjudicial	L01	Categorical of judicial (judicial state)	judicial = 1	0.0547	0.0040	0.0000
SMjudicial	Z00	Categorical of judicial (judicial state)	base level: else	0.0000	0.0000	.
SMRatioTmpTei	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	0.2719	0.0235	0.0000
SMRatioTmpTei	Z01	Categorical of ratio_tmp_tei (front-end ratio)	base level: else	0.0000	0.0000	.
SVratiotmptei_pw1		Variate piecewise version of front end ratio	median(0,ratio_tmp_tei-0,24-0)	0.0023	0.0010	0.0178
SVratiotmptei_pw2		Variate piecewise version of front end ratio	median(0,ratio_tmp_tei-24,36-24)	0.0134	0.0006	0.0000
SVratiotmptei_pw3		Variate piecewise version of front end ratio	median(0,ratio_tmp_tei-36,50-36)	0.0104	0.0010	0.0000
SMrfncind	LY	Categorical of rfnc_ind	rfnc_ind <> "N"	-0.0545	0.0059	0.0000

Variable	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
		(refinanced loan indicator)				
SMrfncind	ZN	Categorical of rfnc_ind (refinanced loan indicator)	base level: else	0.0000	0.0000	.

Third Party Sale Claims Logistic Model

The model parameters for the binomial model to predict the TPS claim type are shown below.

Table 65: TPS Claim Binomial Model Parameters

Variable	ClassVal0	Description	Description Detail	Response	Estimate	StdErr	ProbChiSq
Intercept				TPS	-6.8185	0.0959	0.0000
SVbalance_i		Outstanding balance at start of quarter		TPS	-0.0099	0.0007	0.0000
SVCCI_pw1		Consumer Confidence Index	median(0,CCI-30,91)	TPS	0.0516	0.0011	0.0000
SVCCI_pw2		Consumer Confidence Index	median(0,CCI-91,142-91)	TPS	0.0166	0.0014	0.0000
SVSBOI_pw1		Small Business Optimism Index	median(0,SBOI-80,95-80)	TPS	-0.0193	0.0072	0.0073
SVSBOI_pw2		Small Business Optimism Index	median(0,SBOI-95,110-95)	TPS	-0.0645	0.0034	0.0000
SMproduct	ARM	Categorical of product type	adjustable rate mortgage	TPS	0.2139	0.0389	0.0000
SMproduct	ARMSR	Categorical of product type	adjustable rate mortgage - streamline refinance	TPS	0.3034	0.0540	0.0000
SMproduct	FRM15	Categorical of product type	15 year fixed rate mortgage	TPS	-0.2924	0.0507	0.0000
SMproduct	FRM15SR	Categorical of product type	15 year fixed rate mortgage - streamline refinance	TPS	-0.1368	0.1016	0.1783
SMproduct	FRM30SR	Categorical of product type	30 year fixed rate mortgage - streamline refinance	TPS	0.1474	0.0198	0.0000
SVloansize_raw_grp		Variate version of loansize_raw	min(loansize/1000,600)	TPS	0.0106	0.0006	0.0000
SMseason	L01	Categorical of season	season = "winter"	TPS	-0.0296	0.0139	0.0339
SMseason	L02	Categorical of season	season = "spring"	TPS	0.1641	0.0136	0.0000
SMseason	L03	Categorical of season	season = "summer"	TPS	0.0194	0.0132	0.1425
SMjudicial	L01	Categorical of judicial (judicial state)	judicial = 1	TPS	-0.0539	0.0100	0.0000
SMdpa_govt	LGovt	Categorical of down payment assistance, government level indicator	dpa = "govt"	TPS	-0.0485	0.0326	0.1364

Variable	ClassVal0	Description	Description Detail	Response	Estimate	StdErr	ProbChiSq
SMdpa_nprof	LNPro	Categorical of down payment assistance, non-profit level indicator	dpa = "nonprof"	TPS	0.1832	0.0161	0.0000
SMdpa_rel	LRela	Categorical of down payment assistance, non-profit level indicator	dpa = "relative"	TPS	0.0604	0.0153	0.0000
SVsato_pw1		Spread at origination	min(sato+0.1,0)	TPS	0.1752	0.0235	0.0000
SVsato_pw2		Spread at origination	median(0,sato+0.1,0.7+0.1)	TPS	-0.0356	0.0195	0.0678
SVsato_pw3		Spread at origination	max(0,sato-0.7)	TPS	-0.2303	0.0351	0.0000
SVhpa2yb_pw2		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-85,95-85)	TPS	0.1059	0.0082	0.0000
SVhpa2yb_pw3		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-95,113-95)	TPS	0.0978	0.0017	0.0000
SVhpa2yb_pw4		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-113,120-113)	TPS	0.0014	0.0027	0.6055
SVhpa2yb_pw5		Variate piecewise of hpa2y_blended_r[1]	max(0,hpa2y_blended_r-120)	TPS	0.0228	0.0018	0.0000
SMycslope	L01	Categorical of yield curve slope	1<=ycslope<=2	TPS	0.2368	0.0212	0.0000
SMrfncind	LY	Categorical of rfnc_ind (refinanced loan indicator)	frst_tm_by = "Y"	TPS	-0.1167	0.0137	0.0000
SMDeltaTY10	L01	Categorical of DeltaTy10Init_r[2] (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r < 53	TPS	-0.0179	0.0126	0.1552
SMDeltaTY10	L02	Categorical of DeltaTy10Init_r[2] (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r > 130	TPS	0.1381	0.0259	0.0000
SMDeltaTm3	L01	Categorical of DeltaTm3Init_r[3] (change in 3-month Treasury rate from policy inception to current)	DeltaTm3Init_r > 600	TPS	0.0660	0.0166	0.0000
SMicredit_grp1	L450	Categorical of credit	0<credit_score<=450	TPS	-0.3757	0.1676	0.0250
SMicredit_grp2	L500	Categorical of credit	450<credit_score<=500	TPS	-0.1690	0.0685	0.0136

Variable	ClassVal0	Description	Description Detail	Response	Estimate	StdErr	ProbChiSq
SMicredit_grp3	L600	Categorical of credit	500<credit_score<=600	TPS	-0.1917	0.0182	0.0000
SMicredit_grp4	L630	Categorical of credit	600<credit_score<=630	TPS	-0.1279	0.0182	0.0000
SMicredit_grp5	L680	Categorical of credit	630<credit_score<=680	TPS	-0.0476	0.0166	0.0040
SMicredit_grp6	L720	Categorical of credit	680<credit_score<=720	TPS	-0.0407	0.0209	0.0521
SMicredit_grp7	L745	Categorical of credit	720<credit_score<=745	TPS	-0.0270	0.0314	0.3887
SMicredit_grp8	L800	Categorical of credit	745<credit_score<=800	TPS	-0.0019	0.0304	0.9505
SMicredit_grp9	L850	Categorical of credit	800<credit_score	TPS	0.0133	0.0897	0.8824

Pre-Forclosure Sale Claims Logistic Model

The model parameters for the binomial model to predict the PFS claim type are shown below.

Table 66: PFS Claim Binomial Model Parameters

Variable	ClassVal0	Description	Description Detail	Response	Estimate	StdErr	ProbChiSq
Intercept					-4.4278	0.1419	0.0000
SVbalance_i		Outstanding balance at start of quarter			-0.0084	0.0009	0.0000
SVCCI_pw1		Consumer Confidence Index	median(0,CCI-30,91)		-0.0282	0.0008	0.0000
SVCCI_pw2		Consumer Confidence Index	median(0,CCI-91,142-91)		0.0327	0.0019	0.0000
SVSBOI_pw1		Small Business Optimism Index	median(0,SBOI-80,95-80)		0.1194	0.0038	0.0000
SVSBOI_pw2		Small Business Optimism Index	median(0,SBOI-95,110-95)		0.0019	0.0055	0.7282
SMproduct	ARM	Categorical of product type	adjustable rate mortgage		-0.0777	0.0305	0.0109
SMproduct	ARMSR	Categorical of product type	adjustable rate mortgage - streamline refinance		0.3088	0.0412	0.0000
SMproduct	FRM15	Categorical of product type	15 year fixed rate mortgage		-0.6364	0.0632	0.0000
SMproduct	FRM15SR	Categorical of product type	15 year fixed rate mortgage - streamline refinance		-0.2604	0.1156	0.0243
SMproduct	FRM30SR	Categorical of product type	30 year fixed rate mortgage - streamline refinance		0.3341	0.0185	0.0000
SVloansize_raw_grp		Variate version of loansize_raw	min(loansize/1000,600)		0.0150	0.0008	0.0000
SMpriormod	L01	Categorical of Prior Loan Modifications	prior_mod_cnt = 1		0.0978	0.0138	0.0000
SMpriormod	L02	Categorical of Prior Loan Modifications	prior_mod_cnt = 2		0.3371	0.0253	0.0000

Variable	ClassVal0	Description	Description Detail	Response	Estimate	StdErr	ProbChiSq
SMpriormod	L03	Categorical of Prior Loan Modifications	prior_mod_cnt >= 3		0.5424	0.0434	0.0000
SVpriormod_pw1		Variate piecewise version of prior_mod_cnt	median(0,prior_mod_cnt-3,15-3)		0.2745	0.0470	0.0000
SMseason	L01	Categorical of season	season = "winter"		-0.0819	0.0128	0.0000
SMseason	L02	Categorical of season	season = "spring"		0.0541	0.0125	0.0000
SMseason	L03	Categorical of season	season = "summer"		-0.0020	0.0124	0.8708
SMperiodnbr_clm	L01_04	Categorical of period number	1 <= period_number <= 4		1.3364	0.0699	0.0000
SMperiodnbr_clm	L05	Categorical of period number	period_number = 5		0.7151	0.0475	0.0000
SMperiodnbr_clm	L06	Categorical of period number	period_number = 6		0.3864	0.0364	0.0000
SMperiodnbr_clm	L07	Categorical of period number	period_number = 7		0.2402	0.0308	0.0000
SVperiodnbr_pw1		Variate piecewise version of period number	median(0,period_number-8,40-8)		-0.0456	0.0009	0.0000
SVperiodnbr_pw2		Variate piecewise version of period number	median(0,period_number-40,53-40)		0.0041	0.0030	0.1749
SVperiodnbr_pw3		Variate piecewise version of period number	median(0,period_number-53,68-53)		-0.0267	0.0053	0.0000
SVperiodnbr_pw4		Variate piecewise version of period number	median(0,period_number-68,108-68)		-0.0276	0.0058	0.0000
SMjudicial	L01	Categorical of judicial (judicial state)	judicial = 1		0.1447	0.0097	0.0000
SVhpa2yb_pw1		Variate piecewise of hpa2y_blended_r[1]	min(hpa2y_blended_r,85)		0.0201	0.0017	0.0000
SVhpa2yb_pw2		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-85,95-85)		-0.0079	0.0021	0.0001
SVhpa2yb_pw3		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-95,113-95)		0.0155	0.0014	0.0000
SVhpa2yb_pw4		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-113,120-113)		0.0617	0.0031	0.0000
SVhpa2yb_pw5		Variate piecewise of hpa2y_blended_r[1]	max(0,hpa2y_blended_r-120)		0.0197	0.0018	0.0000
SMycslope	L01	Categorical of yield curve slope	1<=ycslope<=2		0.3401	0.0376	0.0000
SMrfncind	LY	Categorical of rfnc_ind (refinanced loan indicator)	frst_tm_by = "Y"		-0.0278	0.0113	0.0138
SMDeltaTY10	L01	Categorical of DeltaTy10Init_r[2]	DeltaTy10Init_r < 53		0.2191	0.0117	0.0000

Variable	ClassVal0	Description	Description Detail	Response	Estimate	StdErr	ProbChiSq
		(change in 10-year Treasury rate from policy inception to current)					
SMDeltaTY10	L02	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r > 130		-0.0109	0.0335	0.7442
SMDeltaTm3	L01	Categorical of DeltaTm3Init_r^3 (change in 3-month Treasury rate from policy inception to current)	DeltaTm3Init_r > 600		-0.1246	0.0286	0.0000
SMicredit_grp1	L450	Categorical of credit	0<credit_score<=450		-0.4361	0.1468	0.0030
SMicredit_grp2	L500	Categorical of credit	450<credit_score<=500		-0.5500	0.0641	0.0000
SMicredit_grp3	L600	Categorical of credit	500<credit_score<=600		-0.3486	0.0187	0.0000
SMicredit_grp4	L630	Categorical of credit	600<credit_score<=630		-0.1699	0.0190	0.0000
SMicredit_grp5	L680	Categorical of credit	630<credit_score<=680		0.0651	0.0174	0.0002
SMicredit_grp6	L720	Categorical of credit	680<credit_score<=720		0.3212	0.0203	0.0000
SMicredit_grp7	L745	Categorical of credit	720<credit_score<=745		0.5534	0.0271	0.0000
SMicredit_grp8	L800	Categorical of credit	745<credit_score<=800		0.7565	0.0257	0.0000
SMicredit_grp9	L850	Categorical of credit	800<credit_score		0.6637	0.0793	0.0000

Conveyance Severity Model

The model parameters for the Conveyance severity model are shown below.

Table 67: Conveyance Severity Model Parameters

Parameter	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				9.2051	0.0537	0.0000
SVbalance_i_log		Variate version of log transformed outstanding balance at start of quarter	log(balance_i/1000)	0.3201	0.0013	0.0000
SVCCI_pw1		Consumer Confidence Index	median(0,CCI-30,91)	0.0006	0.0000	0.0000
SVCCI_pw2		Consumer Confidence Index	median(0,CCI-91,142-91)	-0.0005	0.0000	0.0000

Parameter	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
SVSBOI_pw1		Small Business Optimism Index	median(0,SBOI-80,95-80)	-0.0022	0.0001	0.0000
SVSBOI_pw2		Small Business Optimism Index	median(0,SBOI-95,110-95)	0.0011	0.0000	0.0000
SVcredit_subsidy_cohort		Credit Subsidy Cohort	SVcredit_subsidy_cohort = credit_subsidy_cohort	-0.0004	0.0000	0.0000
SMproduct	ARM	Categorical of product type	adjustable rate mortgage	0.0100	0.0005	0.0000
SMproduct	ARMSR	Categorical of product type	adjustable rate mortgage - streamline refinance	0.0082	0.0012	0.0000
SMproduct	FRM15	Categorical of product type	15 year fixed rate mortgage	-0.0270	0.0010	0.0000
SMproduct	FRM15SR	Categorical of product type	15 year fixed rate mortgage - streamline refinance	-0.0266	0.0020	0.0000
SMproduct	FRM30SR	Categorical of product type	30 year fixed rate mortgage - streamline refinance	-0.0061	0.0006	0.0000
SMproduct	z_FRM30	Categorical of product type	30 year fixed rate mortgage	0.0000	0.0000	.
SVloansize_raw_grp		Variate version of loansize_raw	min(loansize/1000,600)	0.0291	0.0001	0.0000
SMpriormod	L01	Categorical of Prior Loan Modifications	prior_mod_cnt = 0	0.0504	0.0005	0.0000
SMpriormod	L02	Categorical of Prior Loan Modifications	prior_mod_cnt = 1	0.1078	0.0009	0.0000
SMpriormod	L03	Categorical of Prior Loan Modifications	prior_mod_cnt = 2	0.1655	0.0015	0.0000
SMpriormod	Z00	Categorical of Prior Loan Modifications	prior_mod_cnt >= 3	0.0000	0.0000	.
SVpriormod_pw1		Variate piecewise version of prior_mod_cnt	median(0,prior_mod_cnt-3,15-3)	0.0430	0.0019	0.0000
SMcredit	L01	Credit Score	SMcredit = "L01"	0.0117	0.0009	0.0000
SMcredit	L02	Credit Score	SMcredit = "L02"	0.0067	0.0020	0.0009
SMcredit	Z00	Credit Score	SMcredit = "Z00"	0.0000	0.0000	.
SVcredit_pw1		Variate piecewise of Credit Score	median(0,credit_score-500,625-500)	0.0000	0.0000	0.0001
SVcredit_pw2		Variate piecewise of Credit Score	median(0,credit_score-625,680-625)	0.0000	0.0000	0.0000
SMseason	L01	Categorical of season	season = "winter"	0.0001	0.0003	0.6628
SMseason	L02	Categorical of season	season = "spring"	-0.0019	0.0003	0.0000
SMseason	L03	Categorical of season	season = "summer"	-0.0020	0.0003	0.0000
SMseason	Z04	Categorical of season	season = "fall"	0.0000	0.0000	.
SMjudicial	L01	Categorical of judicial (judicial state)	judicial = 1	0.0461	0.0002	0.0000
SMjudicial	Z00	Categorical of judicial (judicial state)	base level: else	0.0000	0.0000	.

Parameter	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
SMRatioTmpTei	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	0.0092	0.0008	0.0000
SMRatioTmpTei	Z01	Categorical of ratio_tmp_tei (front-end ratio)	base level: else	0.0000	0.0000	.
SVratiotmptei_pw1		Variate piecewise version of front end ratio	median(0,ratio_tmp_tei-0,24-0)	0.0004	0.0000	0.0000
SVratiotmptei_pw2		Variate piecewise version of front end ratio	median(0,ratio_tmp_tei-24,36-24)	0.0005	0.0000	0.0000
SVratiotmptei_pw3		Variate piecewise version of front end ratio	median(0,ratio_tmp_tei-36,50-36)	-0.0004	0.0001	0.0000
SVsato_pw1		Variate piecewise of sato (spread at origination)	min(sato+0.1,0)	-0.0008	0.0002	0.0000
SVsato_pw2		Variate piecewise of sato (spread at origination)	median(0,sato+0.1,0.7+0.1)	0.0265	0.0004	0.0000
SVsato_pw3		Variate piecewise of sato (spread at origination)	max(0,sato-0.7)	-0.0044	0.0001	0.0000
SVhpa2yb_pw1		Variate piecewise of hpa2y_blended_r[1]	min(hpa2y_blended_r,85)	-0.0002	0.0000	0.0000
SVhpa2yb_pw2		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-85,95-85)	-0.0006	0.0001	0.0000
SVhpa2yb_pw3		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-95,113-95)	-0.0015	0.0000	0.0000
SVhpa2yb_pw4		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-113,120-113)	0.0032	0.0001	0.0000
SVhpa2yb_pw5		Variate piecewise of hpa2y_blended_r[1]	max(0,hpa2y_blended_r-120)	0.0006	0.0001	0.0000
SMycslope	L01	Categorical of yield curve slope	Categorical of yield curve slope	0.0071	0.0003	0.0000
SMycslope	Z00	Categorical of yield curve slope	Categorical of yield curve slope	0.0000	0.0000	.
SMrfncind	LY	Categorical of rfnc_ind (refinanced loan indicator)	rfnc_ind <> "N"	-0.0042	0.0004	0.0000
SMrfncind	ZN	Categorical of rfnc_ind (refinanced loan indicator)	base level: else	0.0000	0.0000	.
SMdurdefepi	L02	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 2	-0.0280	0.0004	0.0000
SMdurdefepi	L03	Categorical of dur_def_episode	dur_def_episode = 3	-0.0122	0.0004	0.0000

Parameter	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
		(duration of default episode)				
SMdurdefepi	L04	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 4	0.0039	0.0004	0.0000
SMdurdefepi	L05	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 5	0.0200	0.0005	0.0000
SMdurdefepi	L06	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 6	0.0338	0.0005	0.0000
SMdurdefepi	L07	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 7	0.0458	0.0005	0.0000
SMdurdefepi	L08	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 8	0.0565	0.0006	0.0000
SMdurdefepi	L09	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 9	0.0660	0.0006	0.0000
SMdurdefepi	L10	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 10	0.0760	0.0007	0.0000
SMdurdefepi	L11	Categorical of dur_def_episode (duration of default episode)	dur_def_episode >= 11	0.0812	0.0005	0.0000
SMdurdefepi	Z01	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 1	0.0000	0.0000	.
SVdurdefepi_pw1		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-10,30-10)	0.0064	0.0001	0.0000
SVdurdefepi_pw2		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-30,40-30)	0.0033	0.0002	0.0000
SMDeltaTY10	L01	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r < 53	0.0008	0.0004	0.0324
SMDeltaTY10	L02	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from	DeltaTy10Init_r > 130	0.0027	0.0008	0.001

Parameter	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
		policy inception to current)				
SMDeltaTY10	Z00	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	base level: else	0.0000	0.0000	.
Smloansize	L01	Categorical loansize_raw	loansize_raw<32000	-0.0276	0.0007	0.0000
SMloansize	Z01	Categorical loansize_raw	loansize_raw>=32000	0.0000	0.0000	.
SVloanraw_pw1		Variate piecewise of loansize_raw	median(0,loansize_raw-32000,70000-32000)	0.0000	0.0000	0.0000
SVloanraw_pw2		Variate piecewise of loansize_raw	median(0,loansize_raw-70000,98000-70000)	0.0000	0.0000	0.0000
SVloanraw_pw3		Variate piecewise of loansize_raw	median(0,loansize_raw-98000,180000-98000)	0.0000	0.0000	0.0000
SVloanraw_pw4		Variate piecewise of loansize_raw	median(0,loansize_raw-180000,500000-180000)	0.0000	0.0000	0.0000

Conveyance Recovery Severity Model

The model parameters for the Conveyance Recovery severity model are shown below.

Table 68: Conveyance Recovery Severity Model Parameters

Parameter	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				8.0104	0.0269	0.0000
SVbalance_i_log		Variate version of log transformed outstanding balance at start of quarter	log(balance_i/1000)	0.3012	0.0070	0.0000
SVCCI_pw1		Consumer Confidence Index	median(0,CCI-30,91)	-0.0010	0.0001	0.0000
SVCCI_pw2		Consumer Confidence Index	median(0,CCI-91,142-91)	0.0007	0.0001	0.0000
SVSBOI_pw1		Small Business Optimism Index	median(0,SBOI-80,95-80)	0.0111	0.0005	0.0000
SVSBOI_pw2		Small Business Optimism Index	median(0,SBOI-95,110-95)	0.0201	0.0003	0.0000
SMproduct	ARM	Categorical of product type	adjustable rate mortgage	-0.0909	0.0028	0.0000
SMproduct	ARMSR	Categorical of product type	adjustable rate mortgage - streamline refinance	-0.0207	0.0064	0.0012
SMproduct	FRM15	Categorical of product type	15 year fixed rate mortgage	0.0296	0.0061	0.0000
SMproduct	FRM15SR	Categorical of product type	15 year fixed rate mortgage - streamline refinance	0.2104	0.0107	0.0000
SMproduct	FRM30SR	Categorical of product type	30 year fixed rate mortgage - streamline refinance	0.0371	0.0029	0.0000
SMproduct	z_FRM30	Categorical of product type	30 year fixed rate mortgage	0.0000	0.0000	.

Parameter	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
SVloansize_raw_grp		Variate version of loansize_raw	min(loansize/1000,600)	0.0158	0.0006	0.0000
SMpriormod	L01	Categorical of Prior Loan Modifications	prior_mod_cnt = 1	-0.0379	0.0025	0.0000
SMpriormod	L02	Categorical of Prior Loan Modifications	prior_mod_cnt = 2	-0.0358	0.0047	0.0000
SMpriormod	L03	Categorical of Prior Loan Modifications	prior_mod_cnt >= 3	-0.0177	0.0083	0.0323
SMpriormod	Z00	Categorical of Prior Loan Modifications	prior_mod_cnt = 0	0.0000	0.0000	.
SVpriormod_pw1		Variate piecewise version of prior_mod_cnt	median(0,prior_mod_cnt-3,15-3)	0.0344	0.0099	0.0005
SMseason	L01	Categorical of season	season = "winter"	0.0242	0.0016	0.0000
SMseason	L02	Categorical of season	season = "spring"	0.0142	0.0017	0.0000
SMseason	L03	Categorical of season	season = "summer"	-0.0055	0.0016	0.0009
SMseason	Z04	Categorical of season	season = "fall"	0.0000	0.0000	.
SMjudicial	L01	Categorical of judicial (judicial state)	judicial = 1	-0.0729	0.0013	0.0000
SMjudicial	Z00	Categorical of judicial (judicial state)	base level: else	0.0000	0.0000	.
SMdpa_govt	LGovt	Categorical of down payment assistance, government level indicator	dpa = "govt"	-0.0999	0.0044	0.0000
SMdpa_govt	ZOthr	Categorical of down payment assistance, government level indicator	base level: else	0.0000	0.0000	.
SMdpa_nprof	LNPro	Categorical of down payment assistance, non-profit level indicator	dpa = "nonprof"	-0.1566	0.0021	0.0000
SMdpa_nprof	ZOthr	Categorical of down payment assistance, non-profit level indicator	base level: else	0.0000	0.0000	.
SVsato_pw1		Spread at origination	min(sato+0.1,0)	-0.0296	0.0014	0.0000
SVsato_pw2		Spread at origination	median(0,sato+0.1,0.7+0.1)	-0.1229	0.0024	0.0000
SVsato_pw3		Spread at origination	max(0,sato-0.7)	-0.0066	0.0039	0.0858

Parameter	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
SVhpa2yb_pw1		Variate piecewise of hpa2y_blended_r[1]	min(hpa2y_blended_r,85)	-0.0054	0.0000	0.0000
SVhpa2yb_pw2		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-85,95-85)	0.0274	0.0003	0.0000
SVhpa2yb_pw3		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-95,113-95)	0.0149	0.0002	0.0000
SVhpa2yb_pw4		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-113,120-113)	0.0093	0.0004	0.0000
SVhpa2yb_pw5		Variate piecewise of hpa2y_blended_r[1]	max(0,hpa2y_blended_r-120)	0.0101	0.0003	0.0000
SMrfncind	LY	Categorical of rfnc_ind (refinanced loan indicator)	rfnc_ind <> "N"	-0.2015	0.0023	0.0000
SMrfncind	ZN	Categorical of rfnc_ind (refinanced loan indicator)	base level: else	0.0000	0.0000	.
SMdurdefepi	L02	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 2	0.0103	0.0033	0.0016
SMdurdefepi	L03	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 3	0.0061	0.0031	0.0477
SMdurdefepi	L04	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 4	-0.0104	0.0031	0.0009
SMdurdefepi	L05	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 5	-0.0182	0.0032	0.0000
SMdurdefepi	L06	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 6	-0.0279	0.0033	0.0000
SMdurdefepi	L07	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 7	-0.0339	0.0035	0.0000
SMdurdefepi	L08	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 8	-0.0357	0.0037	0.0000
SMdurdefepi	L09	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 9	-0.0331	0.0039	0.0000
SMdurdefepi	L10	Categorical of dur_def_episode	dur_def_episode = 10	-0.0353	0.0041	0.0000

Parameter	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
		(duration of default episode)				
SMdurdefepi	L11	Categorical of dur_def_episode (duration of default episode)	dur_def_episode >= 11	-0.0403	0.0035	0.0000
SMdurdefepi	Z01	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 1	0.0000	0.0000	.
SVdurdefepi_pw1		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-10,30-10)	0.0023	0.0003	0.0000
SVdurdefepi_pw2		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-10,30-10)	0.0134	0.0012	0.0000
SMDeltaTY10	L01	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r < 53	-0.1235	0.0020	0.0000
SMDeltaTY10	L02	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r > 130	-0.0124	0.0069	0.072
SMDeltaTY10	Z00	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	base level: else	0.0000	0.0000	.
SMDeltaTm3	L01	Categorical of DeltaTm3Init_r^3 (change in 3-month Treasury rate from policy inception to current)	DeltaTm3Init_r > 600	-0.0534	0.0046	0.0000
SMDeltaTm3	Z00	Categorical of DeltaTm3Init_r^3 (change in 3-month Treasury rate from policy inception to current)	base level: else	0.0000	0.0000	.
SMcredit	L01	Credit Score	credit_score = 0	0.1878	0.0047	0.0000
SMcredit	L02	Credit Score	credit_score<500	0.0095	0.0108	0.3794
SMcredit	Z00	Credit Score	credit_score>=500	0.0000	0.0000	.
SVcredit_pw1		Variate piecewise of Credit Score	median(0,credit_score-500,625-500)	0.0000	0.0000	0.4151

Parameter	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
SVcredit_pw2		Variate piecewise of Credit Score	median(0,credit_score-625,680-625)	0.0005	0.0001	0.0000
SMloansize	L01	Categorical loansize_raw	loansize_raw<32000	-0.2417	0.0050	0.0000
SMloansize	Z01	Categorical loansize_raw	loansize_raw>=32000	0.0000	0.0000	.
SVloanraw_pw1		Loan amount	median(0,loansize_raw-32000,70000-32000)	0.0000	0.0000	0.0000
SVloanraw_pw2		Loan amount	median(0,loansize_raw-70000,98000-70000)	0.0000	0.0000	0.0000
SVloanraw_pw3		Loan amount	median(0,loansize_raw-98000,180000-98000)	0.0000	0.0000	0.0000
SVloanraw_pw4		Loan amount	median(0,loansize_raw-180000,500000-180000)	0.0000	0.0000	0.0000

Third Party Sales Severity Model

The model parameters for the Third Party Sales severity model are shown below.

Table 69: Third Party Sales Severity Model Parameters

Parameter	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				8.0119	0.0502	0.0000
SVbalance_i_log		Variate version of log transformed outstanding balance at start of quarter	log(balance_i/1000)	0.6494	0.0041	0.0000
SVSBOI_pw1		Small Business Optimism Index	median(0,SBOI-80,95-80)	-0.0242	0.0027	0.0000
SVSBOI_pw2		Small Business Optimism Index	median(0,SBOI-95,110-95)	-0.0097	0.0006	0.0000
SMproduct	ARM	Categorical of product type	adjustable rate mortgage	0.0667	0.0177	0.0002
SMproduct	ARMSR	Categorical of product type	adjustable rate mortgage - streamline refinance	0.0820	0.0253	0.0012
SMproduct	FRM15	Categorical of product type	15 year fixed rate mortgage	-0.0359	0.0223	0.1076
SMproduct	FRM15SR	Categorical of product type	15 year fixed rate mortgage - streamline refinance	0.0214	0.0471	0.6487
SMproduct	FRM30SR	Categorical of product type	30 year fixed rate mortgage - streamline refinance	0.0217	0.0111	0.0504
SMproduct	z_FRM30	Categorical of product type	30 year fixed rate mortgage	0.0000	0.0000	.
SMpriormod	L01	Categorical of Prior Loan Modifications	prior_mod_cnt = 1	0.0908	0.0057	0.0000
SMpriormod	L02	Categorical of Prior Loan Modifications	prior_mod_cnt = 2	0.1797	0.0091	0.0000
SMpriormod	L03	Categorical of Prior Loan Modifications	prior_mod_cnt >= 3	0.3107	0.0120	0.0000

Parameter	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
SMpriormod	Z00	Categorical of Prior Loan Modifications	prior_mod_cnt = 0	0.0000	0.0000	.
SMseason	L01	Categorical of season	season = "winter"	0.0101	0.0062	0.1005
SMseason	L02	Categorical of season	season = "spring"	-0.0112	0.0060	0.0606
SMseason	L03	Categorical of season	season = "summer"	-0.0042	0.0059	0.4756
SMseason	Z04	Categorical of season	season = "fall"	0.0000	0.0000	.
SMjudicial	L01	Categorical of judicial (judicial state)	judicial = 1	0.2184	0.0048	0.0000
SMjudicial	Z00	Categorical of judicial (judicial state)	base level: else	0.0000	0.0000	.
SMRatioTmpTei	L00	Categorical of ratio_tmp_tei (front-end ratio)	ratio_tmp_tei=0	-0.0563	0.0184	0.0023
SMRatioTmpTei	Z01	Categorical of ratio_tmp_tei (front-end ratio)	base level: else	0.0000	0.0000	.
SVratiotmptei_pw1		Variate piecewise version of front end ratio	median(0,ratio_tmp_tei-0,24-0)	-0.0027	0.0008	0.0004
SVratiotmptei_pw2		Variate piecewise version of front end ratio	median(0,ratio_tmp_tei-24,36-24)	-0.0015	0.0007	0.036
SVratiotmptei_pw3		Variate piecewise version of front end ratio	median(0,ratio_tmp_tei-36,50-36)	-0.0047	0.0013	0.0003
SVsato_pw1		Variate piecewise of sato (spread at origination)	min(sato+0.1,0)	0.0294	0.0100	0.0034
SVsato_pw2		Variate piecewise of sato (spread at origination)	median(0,sato+0.1,0.7+0.1)	0.0841	0.0087	0.0000
SVsato_pw3		Variate piecewise of sato (spread at origination)	max(0,sato-0.7)	0.1076	0.0163	0.0000
SVhpa2yb_pw1		Variate piecewise of hpa2y_blended_r[1]	min(hpa2y_blended_r,85)	0.0058	0.0006	0.0000
SVhpa2yb_pw2		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-85,95-85)	-0.0099	0.0047	0.0364
SVhpa2yb_pw3		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-95,113-95)	-0.0258	0.0008	0.0000
SVhpa2yb_pw4		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-113,120-113)	-0.0216	0.0012	0.0000
SVhpa2yb_pw5		Variate piecewise of hpa2y_blended_r[1]	max(0,hpa2y_blended_r-120)	0.0040	0.0010	0.0000
SMrfncind	LY	Categorical of rfnc_ind	rfnc_ind <> "N"	0.1694	0.0059	0.0000

Parameter	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
		(refinanced loan indicator)				
SMrfncind	ZN	Categorical of rfnc_ind (refinanced loan indicator)	base level: else	0.0000	0.0000	.
SMdurdefepi	L02	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 2	-0.1530	0.0128	0.0000
SMdurdefepi	L03	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 3	-0.0984	0.0125	0.0000
SMdurdefepi	L04	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 4	-0.0385	0.0123	0.0017
SMdurdefepi	L05	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 5	0.0063	0.0124	0.6103
SMdurdefepi	L06	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 6	0.0772	0.0128	0.0000
SMdurdefepi	L07	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 7	0.0900	0.0132	0.0000
SMdurdefepi	L08	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 8	0.1387	0.0138	0.0000
SMdurdefepi	L09	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 9	0.1731	0.0142	0.0000
SMdurdefepi	L10	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 10	0.2125	0.0149	0.0000
SMdurdefepi	L11	Categorical of dur_def_episode (duration of default episode)	dur_def_episode >= 11	0.2199	0.0124	0.0000
SMdurdefepi	Z01	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 1	0.0000	0.0000	.
SVdurdefepi_pw1		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-10,30-10)	0.0243	0.0007	0.0000
SVdurdefepi_pw2		Variate piecewise of dur_def_episode	median(0,dur_def_episode-30,40-30)	0.0067	0.0027	0.0137

Parameter	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
		(duration of default episode)				
SMDeltaTm3	L01	Categorical of DeltaTm3Init_r^2 (change in 3-month Treasury rate from policy inception to current)	DeltaTm3Init_r > 600	-0.1704	0.0060	0.0000
SMDeltaTm3	Z00	Categorical of DeltaTm3Init_r^2 (change in 3-month Treasury rate from policy inception to current)	base level: else	0.0000	0.0000	.

Pre-Foreclosure Sale Severity Model

The model parameters for the Pre-Foreclosure Sale severity model are shown below.

Table 70: Pre-Foreclosure Sale Severity Model

Parameter	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
Intercept				7.0319	0.0535	0.0000
SVbalance_i_log		Variate version of log transformed outstanding balance at start of quarter	log(balance_i/1000)	0.8103	0.0040	0.0000
SMproduct	ARM	Categorical of product type	adjustable rate mortgage	-0.0243	0.0084	0.004
SMproduct	ARMSR	Categorical of product type	adjustable rate mortgage - streamline refinance	0.1222	0.0134	0.0000
SMproduct	FRM15	Categorical of product type	15 year fixed rate mortgage	-0.0838	0.0253	0.0009
SMproduct	FRM15SR	Categorical of product type	15 year fixed rate mortgage - streamline refinance	0.0852	0.0428	0.0465
SMproduct	FRM30SR	Categorical of product type	30 year fixed rate mortgage - streamline refinance	0.1701	0.0066	0.0000
SMproduct	z_FRM30	Categorical of product type	30 year fixed rate mortgage	0.0000	0.0000	.
SMseason	L01	Categorical of season	season = "winter"	0.0106	0.0050	0.0343
SMseason	L02	Categorical of season	season = "spring"	-0.0206	0.0047	0.0000
SMseason	L03	Categorical of season	season = "summer"	-0.0100	0.0048	0.037
SMseason	Z04	Categorical of season	season = "fall"	0.0000	0.0000	.
SMjudicial	L01	Categorical of judicial (judicial state)	judicial = 1	0.0340	0.0037	0.0000

Parameter	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
SMjudicial	Z00	Categorical of judicial (judicial state)	base level: else	0.0000	0.0000	.
SMdpa_govt	LGovt	Categorical of down payment assistance, government level indicator	dpa = "govt"	0.0606	0.0142	0.0000
SMdpa_govt	ZOthr	Categorical of down payment assistance, government level indicator	base level: else	0.0000	0.0000	.
SMdpa_nprof	LNPro	Categorical of down payment assistance, non-profit level indicator	dpa = "nonprof"	0.1383	0.0056	0.0000
SMdpa_nprof	ZOthr	Categorical of down payment assistance, non-profit level indicator	base level: else	0.0000	0.0000	.
SVhpa2yb_pw1		Variate piecewise of hpa2y_blended_r[1]	min(hpa2y_blended_r,85)	-0.0004	0.0006	0.5094
SVhpa2yb_pw2		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-85,95-85)	-0.0272	0.0008	0.0000
SVhpa2yb_pw3		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-95,113-95)	-0.0151	0.0004	0.0000
SVhpa2yb_pw4		Variate piecewise of hpa2y_blended_r[1]	median(0,hpa2y_blended_r-113,120-113)	0.0100	0.0011	0.0000
SVhpa2yb_pw5		Variate piecewise of hpa2y_blended_r[1]	max(0,hpa2y_blended_r-120)	0.0012	0.0006	0.0594
SMycslope	L01	Categorical of yield curve slope	Categorical of yield curve slope	-0.2004	0.0050	0.0000
SMycslope	Z00	Categorical of yield curve slope	Categorical of yield curve slope	0.0000	0.0000	.
SMfrst_tm_by	1	Categorical of frst_tm_by (first-time buyer)	frst_tm_by = "Y"	0.0669	0.0052	0.0000
SMfrst_tm_by	2	Categorical of frst_tm_by (first-time buyer)	base level: else	0.0000	0.0000	.
SMrfncind	LY	Categorical of rfnc_ind (refinanced loan indicator)	rfnc_ind <> "N"	0.2295	0.0064	0.0000
SMrfncind	ZN	Categorical of rfnc_ind (refinanced loan indicator)	base level: else	0.0000	0.0000	.
SMdurdefepi	L02	Categorical of dur_def_episode	dur_def_episode = 2	0.1065	0.0054	0.0000

Parameter	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
		(duration of default episode)				
SMdurdefepi	L03	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 3	0.1929	0.0057	0.0000
SMdurdefepi	L04	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 4	0.2572	0.0063	0.0000
SMdurdefepi	L05	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 5	0.3344	0.0073	0.0000
SMdurdefepi	L06	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 6	0.3951	0.0081	0.0000
SMdurdefepi	L07	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 7	0.4495	0.0092	0.0000
SMdurdefepi	L08	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 8	0.4780	0.0103	0.0000
SMdurdefepi	L09	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 9	0.5271	0.0116	0.0000
SMdurdefepi	L10	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 10	0.5792	0.0129	0.0000
SMdurdefepi	L11	Categorical of dur_def_episode (duration of default episode)	dur_def_episode >= 11	0.6112	0.0104	0.0000
SMdurdefepi	Z01	Categorical of dur_def_episode (duration of default episode)	dur_def_episode = 1	0.0000	0.0000	.
SVdurdefepi_pw1		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-10,30-10)	0.0258	0.0015	0.0000
SVdurdefepi_pw2		Variate piecewise of dur_def_episode (duration of default episode)	median(0,dur_def_episode-30,40-30)	-0.0186	0.0085	0.0294
SMDeltaTY10	L01	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r < 53	0.2684	0.0047	0.0000

Parameter	Level1	Description	Description Detail	Estimate	StdErr	ProbChiSq
SMDeltaTY10	L02	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	DeltaTy10Init_r > 130	-0.0451	0.0122	0.0002
SMDeltaTY10	Z00	Categorical of DeltaTy10Init_r^2 (change in 10-year Treasury rate from policy inception to current)	base level: else	0.0000	0.0000	.
SMcredit	L01	Credit Score	credit_score = 0	-0.2430	0.0128	0.0000
SMcredit	L02	Credit Score	credit_score<500	-0.0099	0.0302	0.7417
SMcredit	Z00	Credit Score	credit_score>=500	0.0000	0.0000	.
SVcredit_pw1		Variate piecewise of Credit Score	median(0,credit_score-500,625-500)	-0.0007	0.0001	0.0000
SVcredit_pw2		Variate piecewise of Credit Score	median(0,credit_score-625,680-625)	-0.0008	0.0001	0.0000

Model Validation

Model validation was accomplished by applying the models developed using the training set to the validation dataset. The application of the models to the validation data produces the probability of each type of claim settlement type and a predicted net loss. The actual target variable is then compared to the predicted target variable to ensure the model fits the claim settlement process and net loss process without over-fitting the actual data.

Specifically, for the loss settlement models, for the final loss settlement type we calculate the predicted probability of the settlement type. The actual settlement type is 1 for the final type of claim and 0 for all other claim types. The probability of each claim type for each record in the validation dataset is derived from the model parameters. The sum of all predicted claim type probabilities is 1 for each record.

For the net loss severity models, we calculate a predicted net loss. We also summarize the actual net loss for each claim. The predicted loss severity for each record in the validation dataset is derived from the model parameters.

Decile charts are then created for each final claim type selection and each net loss. All records are sorted, or ranked, in ascending order by the predicted value. Ten equal-sized decile groups are created with 10% of the records in each group. The sum of the actual probability and the sum of the predicted probability for each claim type within each decile is calculated for the claim type models. The sum of the actual net loss and the sum of the predicted net loss within each decile is calculated for the loss severity models. The actual and predicted numbers are then compared for consistency. The objective of a model is to have a significant spread in predicted values while maintaining a close relationship between the resulting actual and predicted values.

Loss Mitigation Model

The validation charts for the loss mitigation models are shown below.

Figure 48: Loss Mitigation Binomial Model Validation

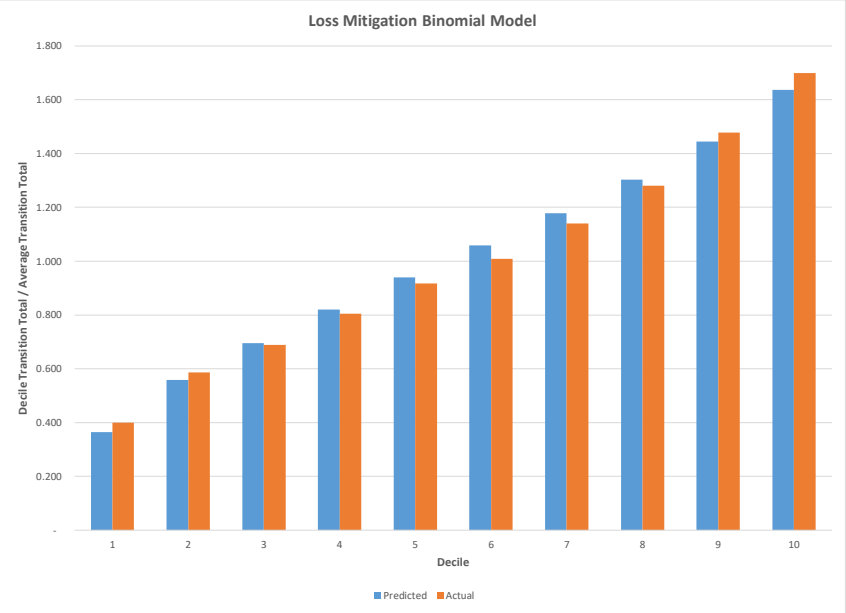
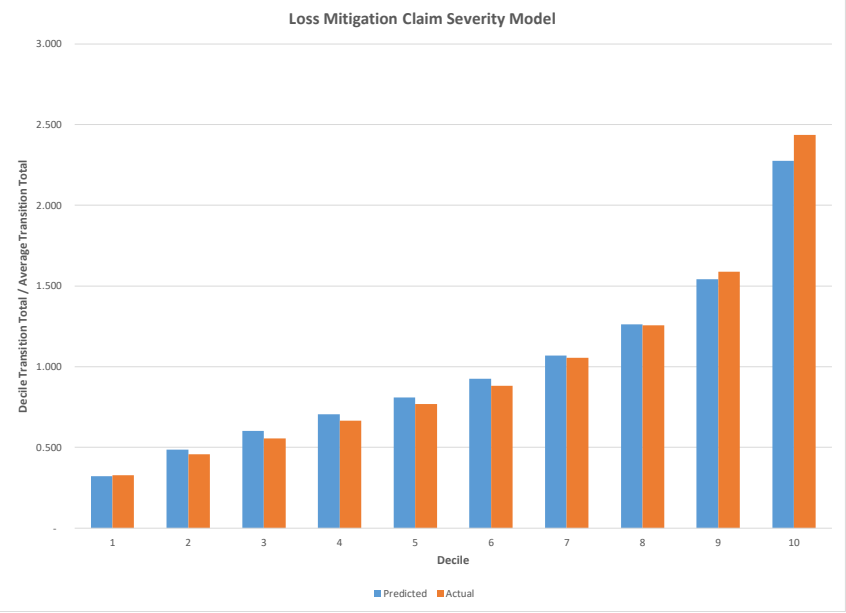


Figure 49: Loss Mitigation Claim Severity Model Validation



Claim Type Model

The validation charts for the Claim Type model are shown below.

Figure 50: Conveyance Claim Type Model Validation Chart

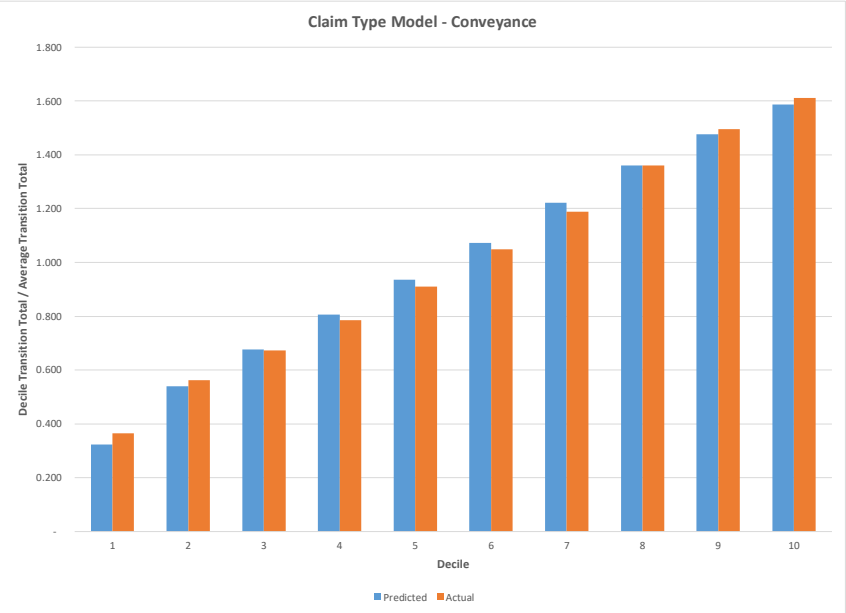


Figure 51: TPS Claim Type Model Validation Chart

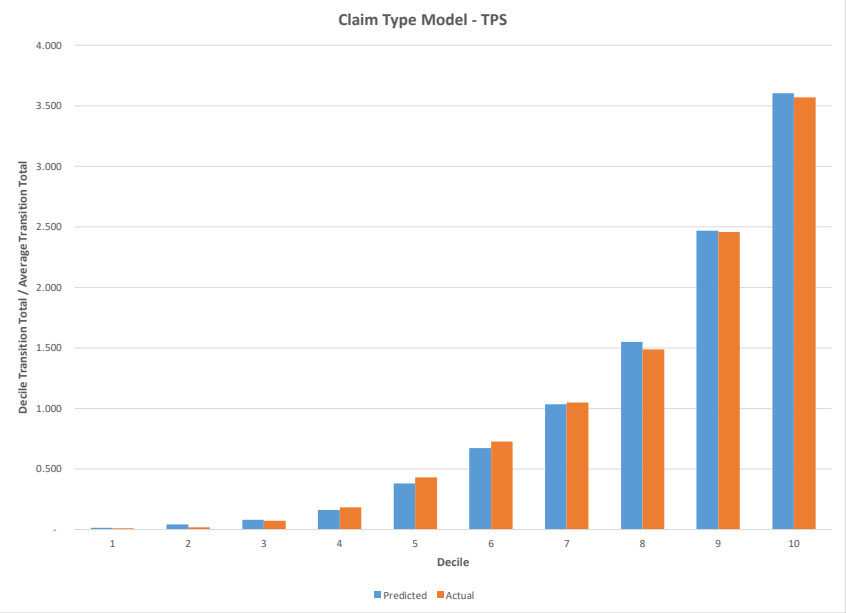
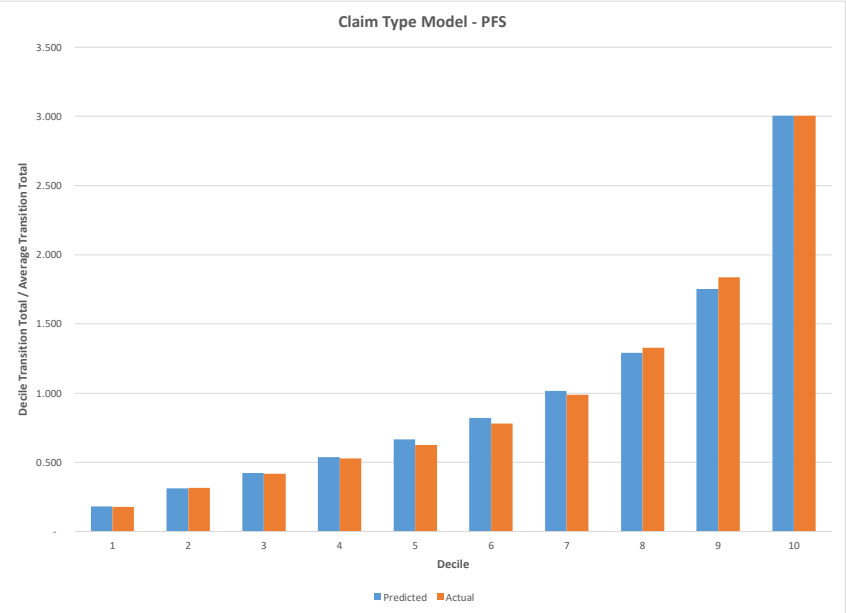


Figure 52: PFS Claim Type Model Validation Chart



Claim Type Severity Models

The validation charts for the Claim Type Severity Models are shown below.

Figure 53: Conveyance Loss Severity Model Validation

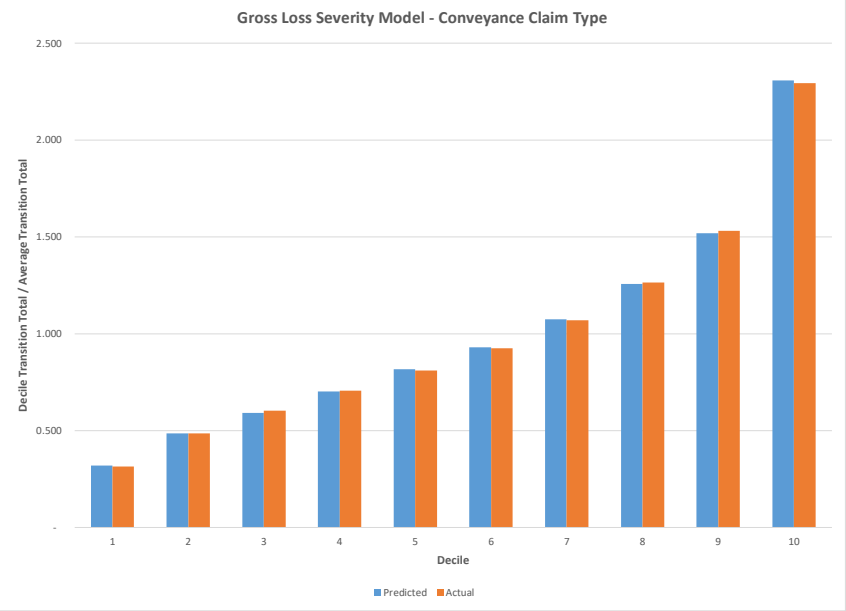


Figure 54: Conveyance Recovery Loss Severity Model Validation

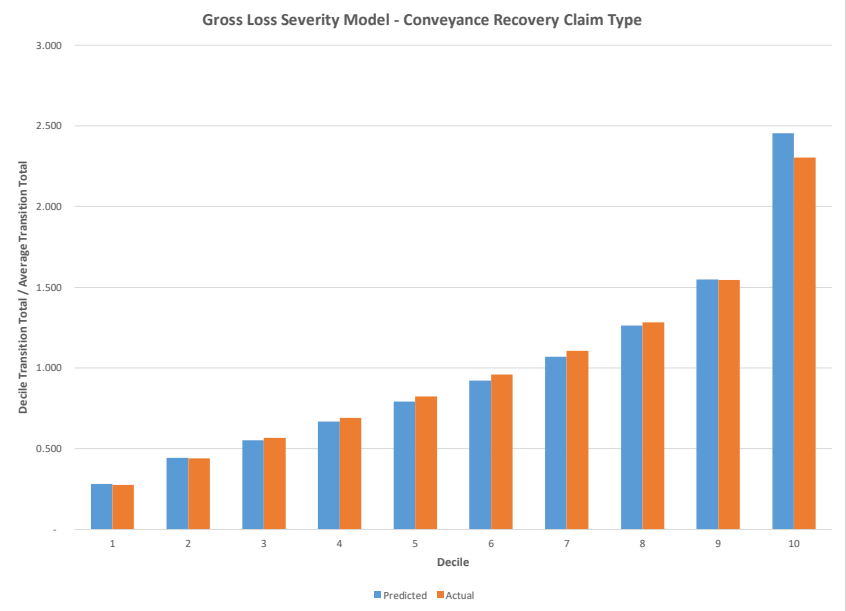


Figure 55: PFS Loss Severity Model Validation

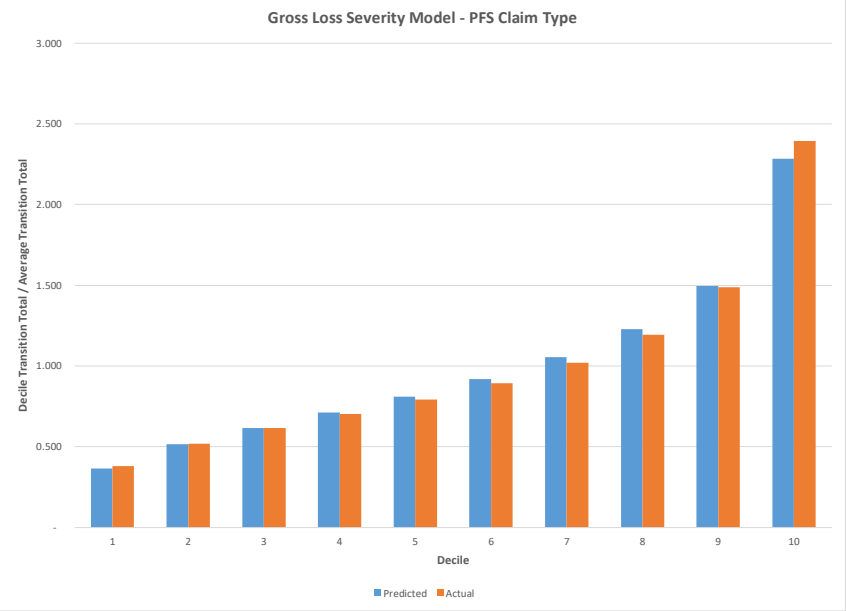
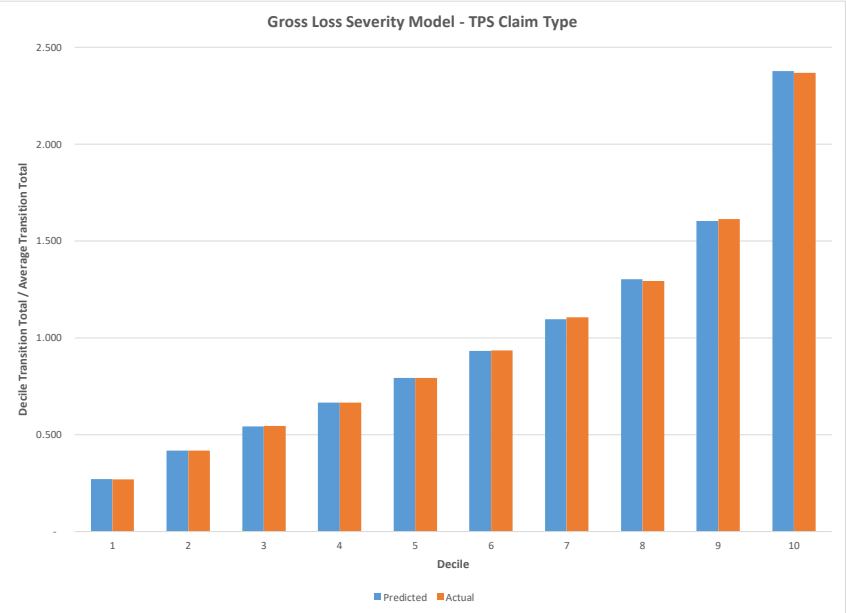


Figure 56: TPS Loss Severity Model Validation



Appendix D: Economic Scenarios

To measure the possible variation in MMI's Cash Flow NPV on the existing portfolio, we developed a baseline projection using OMB Economic Assumptions and also projections for ten additional deterministic economic scenarios from Moody's. For this analysis, we used the Moody's October 2020 forecast of the U.S. economy. For purposes of our analysis, the components of Moody's forecast include:

- HPI at the MSA, state, regional and national levels
- One-year CMT rate
- Three-year CMT rate
- Five-year CMT rate
- 10-year CMT rate
- 30-year CMT rate
- Commitment rate on 30-year fixed-rate mortgages
- Unemployment rates at the MSA, state, regional and national levels
- GDP

Alternative Scenarios

To assess the effect of alternative economic scenarios on the Cash Flow NPV, ten alternative scenarios from Moody's were used. The ten Moody's scenarios are:

- Baseline
- Alternative 0 – Upside (4th Percentile)
- Alternative 1 – Upside (10th Percentile)
- Alternative 2 – Downside (75th Percentile)
- Alternative 3 – Downside (90th Percentile)
- Alternative 4 – Downside (96th Percentile)
- Slower Trend Growth
- Stagflation
- Next-Cycle Recession
- Low Oil Price

The Moody's projections provide a range of better than expected economic assumptions and worse than expected economic assumptions. This range of assumptions produces a range of Cash Flow NPV projections.

Graphical Depiction of the Scenarios

Figure 57 shows the future movements of the HPI under the baseline and the alternative economic scenarios. In the Baseline scenario, the HPI is flat through the third quarter of 2021, and then increases over the remainder of the projection period. The rate of increase is just under 5% per year through 2029, and then decreases to about 3% per year for the remainder of the projection period

Figure 57: Paths of the Future National House Price Index in Different Scenarios

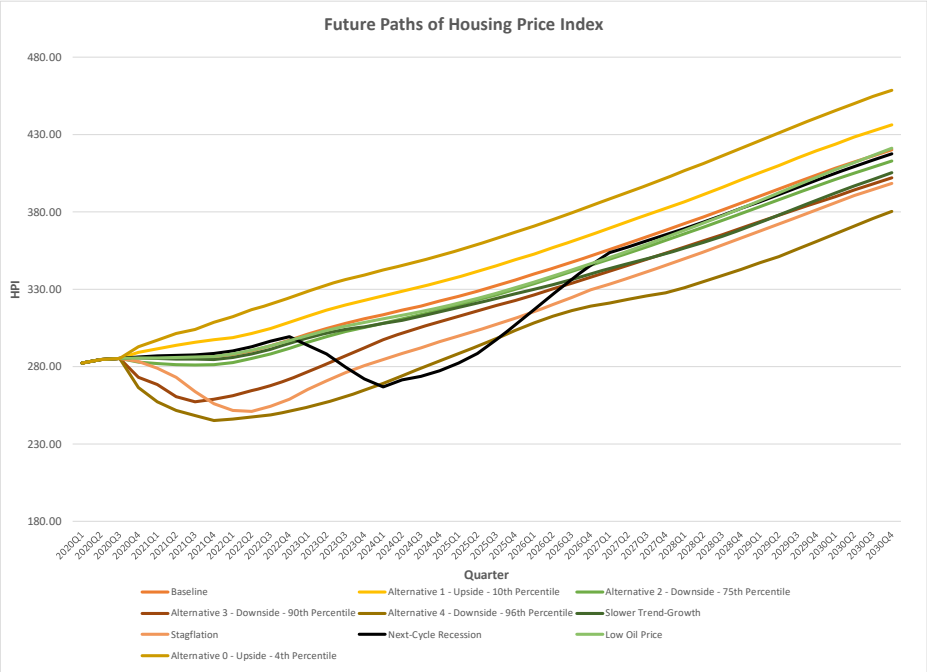


Figure 58 shows the forecasted mortgage rate of 30-year fixed-rate mortgages for the ten Moody's scenarios. For the Moody's Baseline Scenario, the mortgage interest rate decreases to about 3% through the second quarter of 2021 and then increases through 2028. The mortgage rate levels off at approximately 5.5% by 2029.

Figure 58: Paths of the Future Mortgage Rate

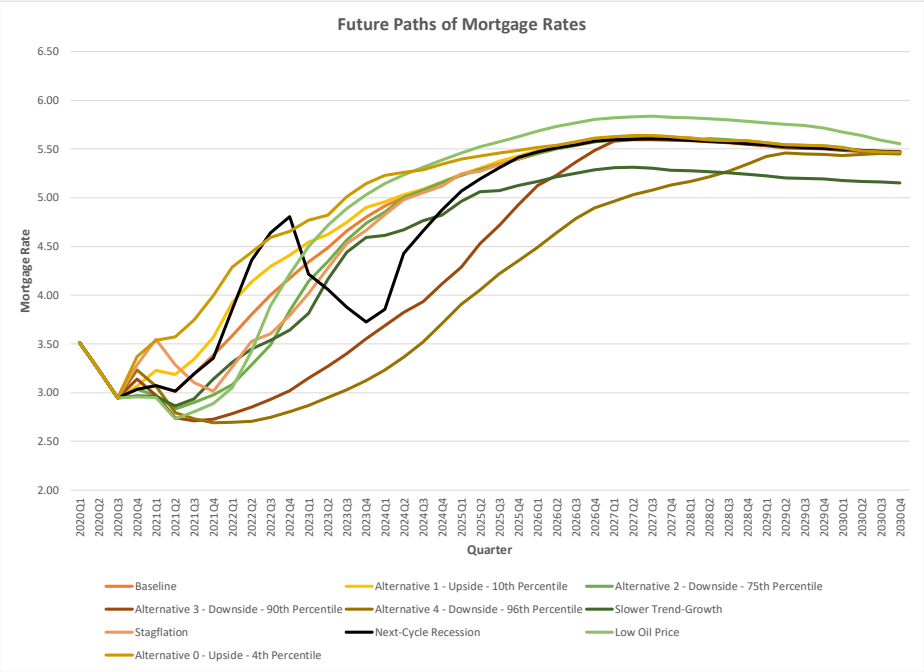
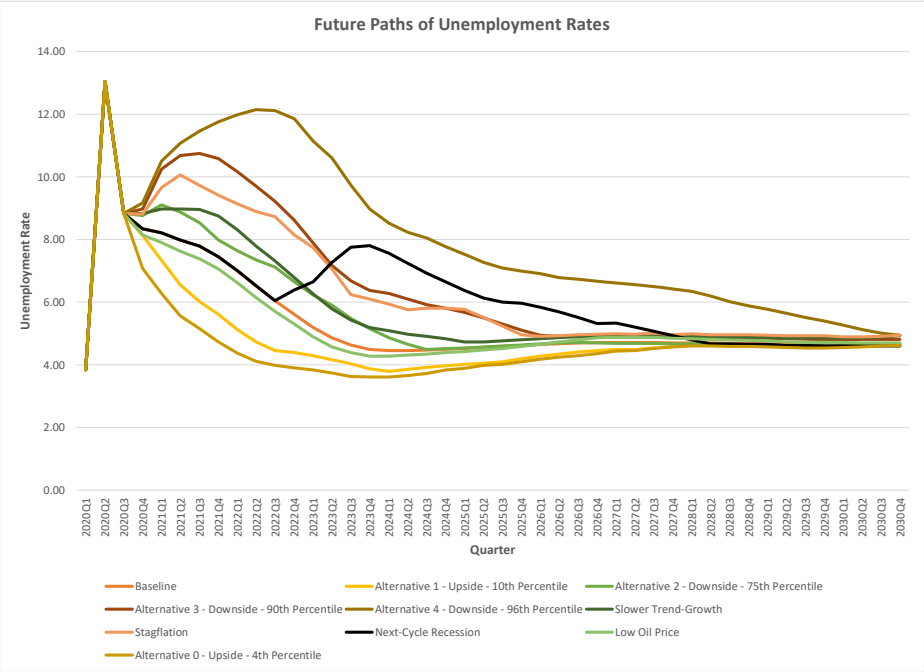


Figure 59 shows the forecasted unemployment rate under alternative economic scenarios. Under the Moody's Baseline forecast, the unemployment rate is projected to decrease through 2023 to approximately 4.5%, and then remains steady at that level for the remainder of the projection period. Under this scenario, it is projected that it will take approximately three years for unemployment to fully return to more stable levels, and it is projected to stabilize at a level higher than pre-COVID-19 unemployment levels.

Figure 59: Paths of Future National Unemployment Rate



Stochastic Simulation

This section describes the stochastic models fitted to generate the economic variables simulations used in the projection of Cash Flow NPV.

The economic variables modeled herein as stochastic for computing expected present values include:

- Six-month CMT rates
- 10-year CMT rates
- One-year CMT Rates
- 30-year CMT rates
- 30-year FRM rates
- FHFA national purchase only house price index (HPI-PO)
- Unemployment rates
- Gross domestic product (GDP)
- Small business normalized optimism index (NOI)
- Consumer confidence index (CCI)

Historical Data

A. Interest Rates

Figure 60 shows historical interest rates since 1971.

This graph illustrates the variability of interest rates over time and the consistent spread between rates. Shown are the one year CMT rate (tr1y), 10-year CMT rate (tr10y) and the 30-year FRM rate (mr).

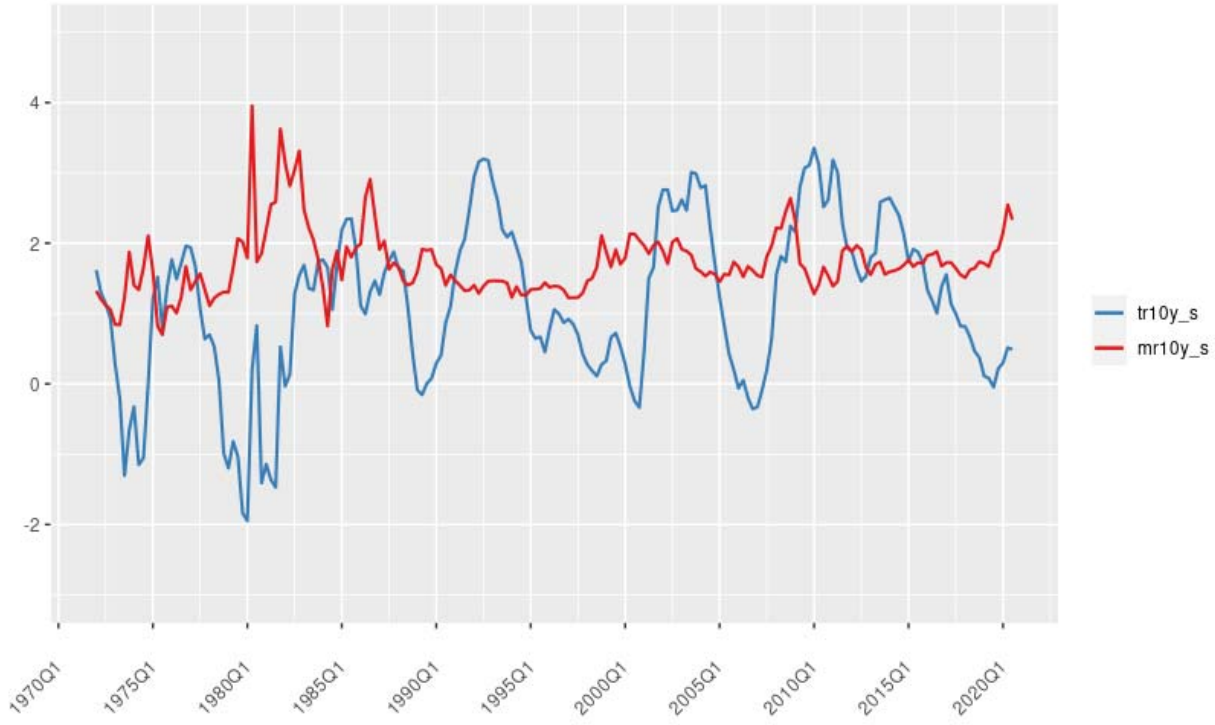
High inflation rates caused by the global oil crisis in the late 1970's were the major factor for the historically high level in early 1980's. The Federal Reserve shifted its monetary policy from managing interest rates to managing the money supply as a way to influence interest rates after this period of time. The tr1y was around 5% in Calendar Year 1971 and increased steadily to its peak of 16.31% in Calendar Year 1981 Quarter 3. After that, it followed a decreasing trend and reached an all-time low of 0.10% in Calendar Year 2014 Quarter 2. Since then rates had started a slow upward trend until recently, where there is a sharp downward trend as a result of the COVID-19 pandemic.

Figure 60: Historical Interest Rates (%)

Figure 61 shows historical interest rate spreads, including the spread between 10-year and one-year CMT rates

(tr10y_s) and the spread between the 30-year mortgage rate and the 10-year Treasury rate (mr10y_s). Both spreads are primarily positive with long cycles. Lower and negative spreads typically correspond with economic downturns, as was seen during the late 1970's through early 1980's. Also note, the spread of the mortgage rate over the 10-year CMT rate is always positive, reflecting the premium for credit risk.

Figure 61: Historical Interest Rate Spreads (%)



B. House Price Appreciation Rates

The national HPA rate is derived from the FHFA repeat sales house price indexes (HPIs) of purchase-only (PO) transactions. The PO HPI provides a reliable measure of housing market conditions, since it is based on repeat sales at market prices and does not use any appraised values.

The HPA series being modeled is defined as:

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

Figure 62 shows the national quarterly HPA from Calendar Year 1991 Quarter 1 to Calendar Year 2020 Quarter 2. The long-term average quarterly HPA is around 0.87% (3.30% annual rate).

Figure 62: Historical National Quarterly HPA

The HPA increased steadily before 2004, and the quarterly appreciation rate was around 1.14%. Then house prices rose sharply starting in 2004. The average quarterly house price appreciation rate was 1.88% during the subprime mortgage expansion period from 2004 to 2006, and reached its peak of 2.59% in Calendar Year 2005 Quarter 2. After 2006, the average growth rate of house prices became negative until 2011 when appreciation returns to a positive value. Following an almost eight quarter period of a nearly flat appreciation rate, the last two quarters showed an sharp decrease to nearly 0% appreciation, again, resulting from the economic shock COVID-19 has created.

Table 71 shows the quarterly HPA by selected historical time-periods.

Table 71: Average Quarterly HPA by Time Span

Period	Average Quarterly HPA
1991 – 2003	1.13%
2004 – 2006	1.87%
2007 – 2010	-1.23%
2011 – 2020-Q3	1.12%

C. Confidence Indices

The Small Business Normalized Optimism Index (NOI) and Consumer Confidence Index (CCI) are confidence indices based on surveys conducted throughout the year by The Conference Board. These indexes are designed to provide a relative measure of how optimistic or pessimistic consumers and small business are regarding their expected financial situation. Both indices are based around 100 points where indicators above 100 signal relative optimism for the future of the economy, values below 100, relative pessimism. Figure 63 and Figure 64 graph CCI and NOI, with noted sharp drops in confidence associated to the 2008 mortgage crisis and the recent COVID-19 pandemic.

Figure 63: Consumer Confidence Index

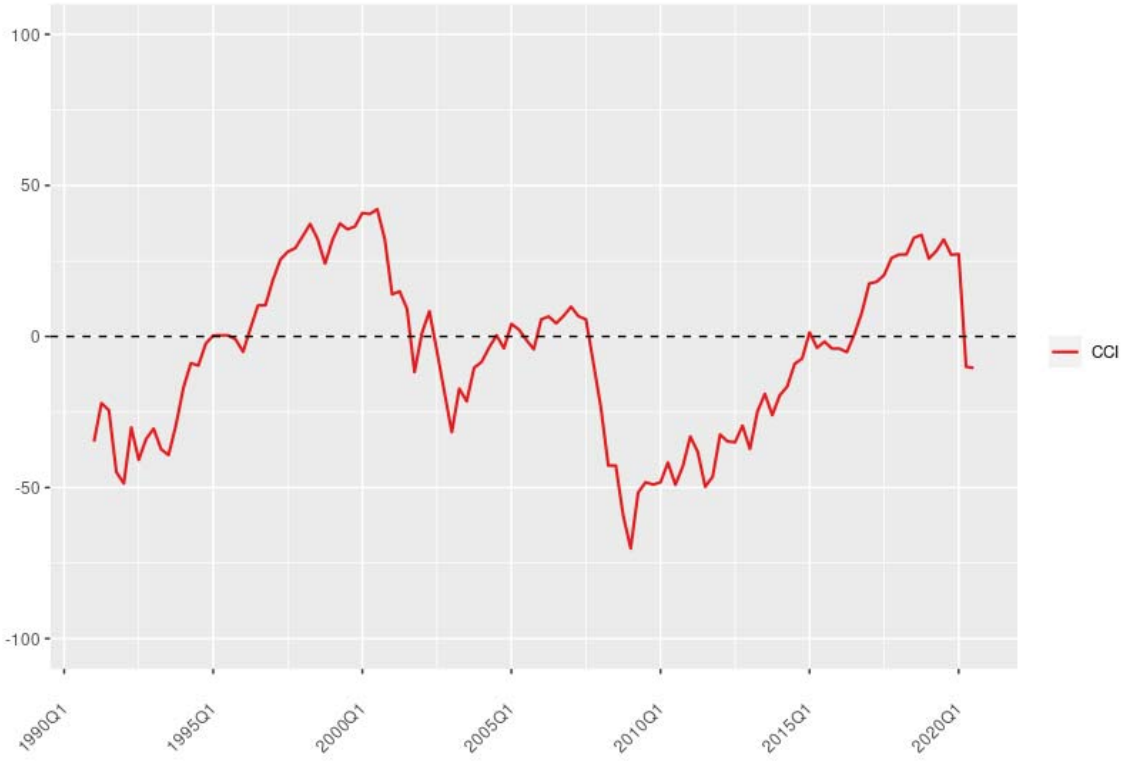
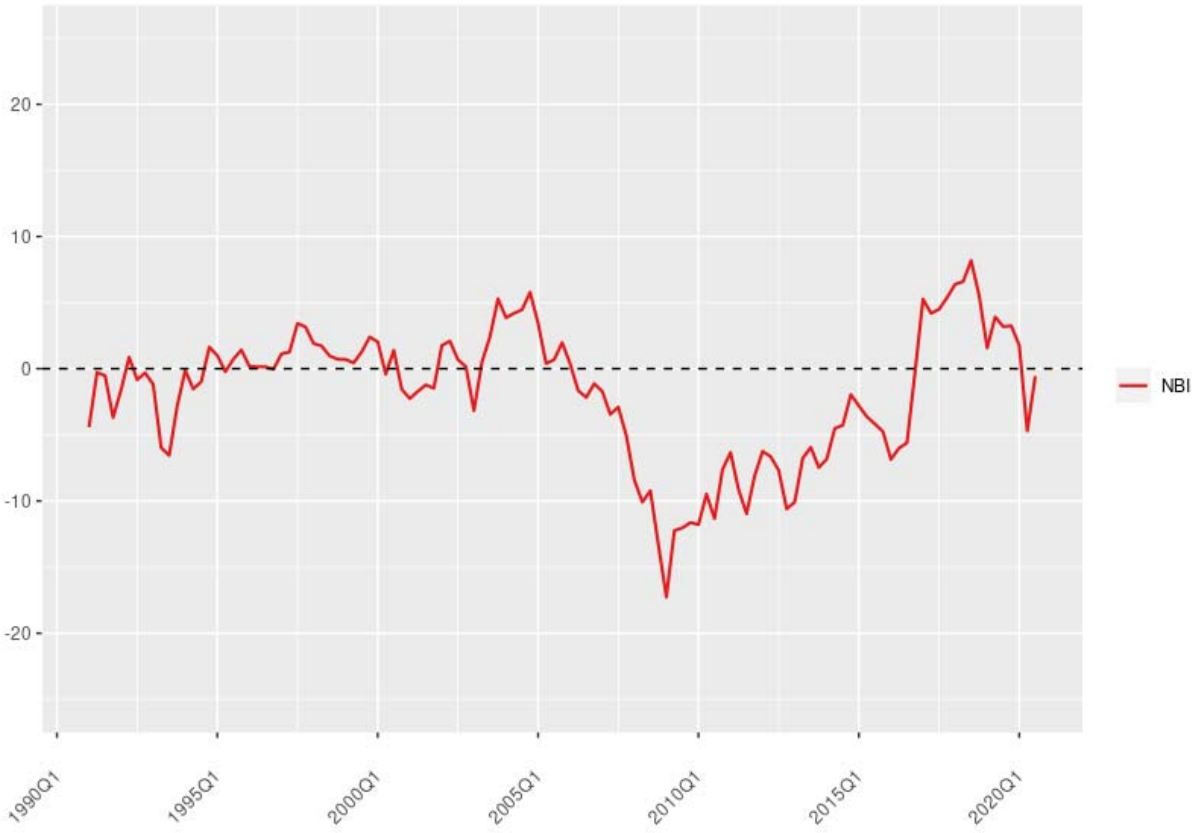


Figure 64: Small Business Normalized Optimism Index

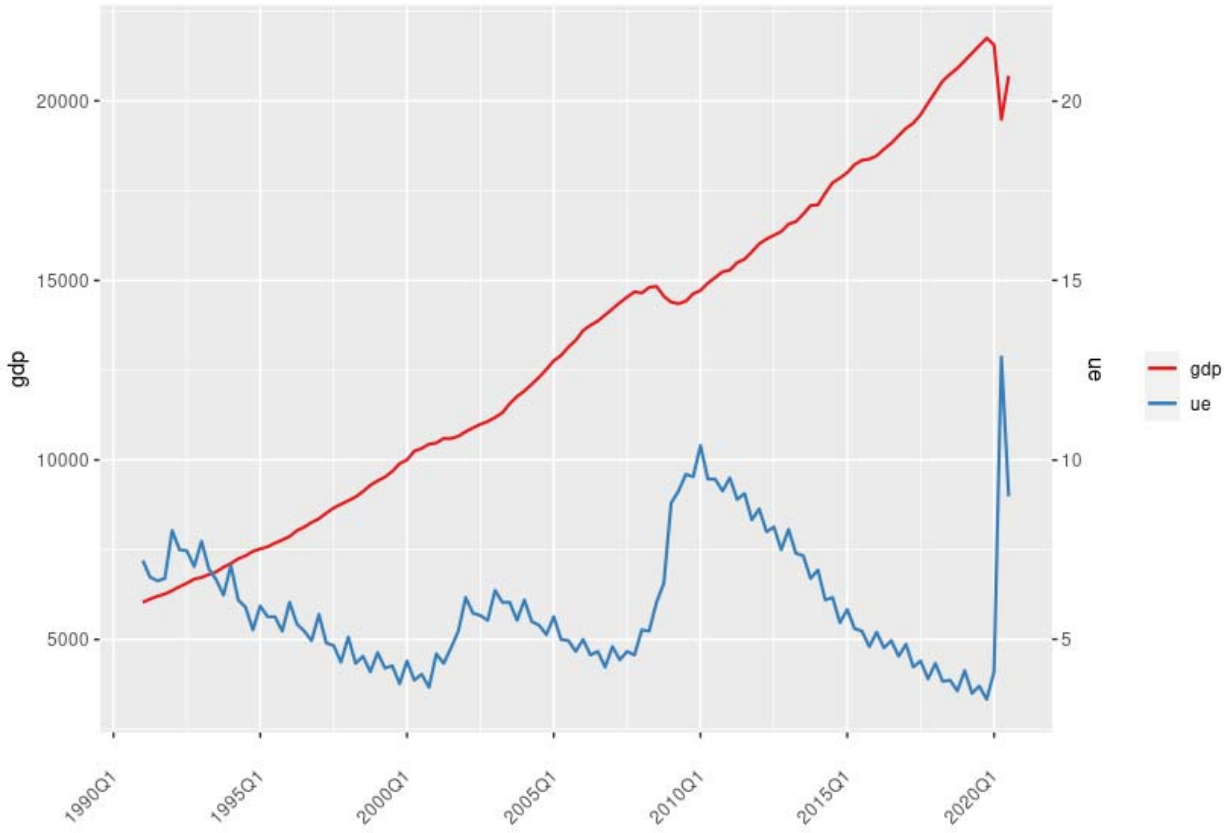


Modeling Method

In financial econometrics, predicting the dependence in the co-movements of these series is important when simulating a set of economic factors. This is illustrated in Figure 60, where interest rates track closely.

Long periods of high unemployment will lead to lower GDP. In Figure 65, we can see two obvious examples of this following the mortgage crisis in 2008 and again with the recent COVID-19 pandemic.

Figure 65: Unemployement vs. GDP



Volatilities will also move together across these series. High levels of economic instability and uncertainty will lead to volatility in these measures, affecting all economic indicators. A modeling method that accounts for these factors will lead to models that are more predictive.

Recognizing and accounting for these features through a multivariate model should lead to more accurate empirical models than working with separate univariate models.

For these reasons a multivariate General Auto Regressive Conditional Heteroscedasticity (GARCH) modeling approach was chosen.

Univariate GARCH models are typically specified as GARCH(*p,q)* where *p* is the auto regressive (AR) component of $\sigma_t{}^2$, and *q* is the auto regressive component of the error term. Multivariate GARCH models are defined similarly to a standard GARCH model, where the univariate term is replaced with a vector of terms. Mezrich (1995) and Shephard (1996) provide a more detailed explanation of these models.

There are a number of implementations of multivariate GARCH models. One such implementation, Dynamic Conditional Correlation (DCC) estimators, have the flexibility of univariate GARCH but avoid the complexity of conventional multivariate GARCH algorithms. Engle and Sheppard (2000) detail descriptions and examples of

using a DCC models for time series analysis.

The 'rmgarch' package implemented with the Cran-R project was specifically used for this modeling effort, developed by Ghalanos (2019), and based off the methods described by Engle (2000).

Data Transformation

The algorithms required to calculate maximum likelihood estimates in these families of models are prone to non-convergence. Variable scale, stationarity of the variables, and covariance within the variable vector set are often the underlying issue when dealing with non-convergence in these complex matrix calculations. Data transformation was performed on these variables to provide a more robust and consistent estimate.

Dickey-Fuller stationarity tests were performed on all variables. GDP and HPA test as non-stationary. As a result, first difference transformations were applied to all variables to provide stationarity. Further scaling was required for index variables (*Ind*) using a log transformation:

$$Ind_{trans} = \ln(Ind + \sqrt{Ind^2 + 1}) \qquad (1)$$

Table 72 below provides a description of each variable transformation.

Model Specifications

Each variable is provided a univariate type specification, in a standard (p,q) format where p,q for the ARMA (mean) specification describes the number of autoregressive and moving average lags to include in the model, and (p,q) for the GARCH specification correspond to the autoregressive components and heteroskedastic components (auto regressive component of error term) respectively. See Table 72 for each variable specification.

Table 72: Model Variable Transformations and specifications

VARIABLE	VARIABLE TRANSFORMATION	ARMA(P,Q)	GARCH(P,Q)	DISTRIBUTION
6-MONTH	First difference	(0,1)	(1,1)	Normal
1-YEAR	First difference	(1,0)	(1,1)	Normal
10-YEAR	First difference	(1,0)	(1,1)	Normal
30-YEAR	First difference	(1,0)	(1,1)	Normal
30-YEAR FRM	First difference	(1,0)	(1,1)	Normal
UNEMPLOYMENT	First difference	(0,0)	(1,1)	Normal

VARIABLE	VARIABLE TRANSFORMATION	ARMA(P,Q)	GARCH(P,Q)	DISTRIBUTION
GDP	First difference, log function transformation	(1,1)	(1,1)	Skewed generalized error
HPI	First difference, log function transformation	(1,1)	(1,0)	Skewed student-t
NOI	First difference, log function transformation	(0,0)	(0,1)	Normal
CCI	First difference, log function transformation	(0,0)	(0,1)	Normal

When fitting a DCC model, the dynamic correlation is fitted with an autoregressive parameter that is applied across all variables. This was set with a (p,q) value of (1,1), describing the correlation across all variables as one autoregressive and one moving average period. These parameters are then used in calculating the correlation matrix.

Table 73 provides all parameter estimates, where “mu” is the mean, “ar” represent the auto regressive and “ma” represent the moving average of the mean model.

Parameters ”omega”, “alpha” and “beta” are the mean, autoregressive, and heteroskedastic parameters of the variance model.

Parameters “skew” and “shape” are estimates to account for specified skewed distributions (GDP and HPI).

Table 73: Parameter Estimates

VARIABLE	ESTIMATE
TR1YR.MU	0.017689
TR1YR.MA1	0.728266
TR1YR.OMEGA	0.000356
TR1YR.ALPHA1	0.34166

VARIABLE	ESTIMATE
TR1YR.BETA1	0.65734
TR6M.MU	-0.24204
TR6M.AR1	0.844206
TR6M.OMEGA	0.000333
TR6M.ALPHA1	0.249041
TR6M.BETA1	0.749959
TR10YR.MU	1.788644
TR10YR.AR1	0.978005
TR10YR.OMEGA	0.037319
TR10YR.ALPHA1	0.177057
TR10YR.BETA1	0.456361
TR30YR.MU	2.013788
TR30YR.AR1	0.983967
TR30YR.OMEGA	0.068666
TR30YR.ALPHA1	0.282963
TR30YR.BETA1	0.20449
MR.MU	3.154242
MR.AR1	0.974412
MR.OMEGA	0.045142
MR.ALPHA1	0.359321
MR.BETA1	0.231788
UE.OMEGA	0.006415
UE.ALPHA1	1.23E-07

VARIABLE	ESTIMATE
UE.BETA1	0.999
GDP.MU	5.646064
GDP.AR1	-0.39614
GDP.MA1	0.553704
GDP.OMEGA	0.007758
GDP.ALPHA1	0.073694
GDP.BETA1	0.897449
GDP.SKEW	0.84059
GDP.SHAPE	0.44123
HPI.MU	1.010044
HPI.OMEGA	0.968759
HPI.ALPHA1	0.327666
HPI.SKEW	0.673737
NOI.MU	0.04032
NOI.AR1	0.052933
NOI.OMEGA	0.627161
NOI.ALPHA1	0.117652
NOI.BETA1	0.748712
CCI.MU	0.220487
CCI.AR1	0.066981
CCI.OMEGA	0.099934
CCI.ALPHA1	6.82E-11
CCI.BETA1	0.998999

COVID-19 Pandemic Considerations

The impact from the COVID-19 pandemic is noticeable and dramatic when analyzing these economic indicators. Dramatic, historic, and rapid changes to these economic measures provided additional challenges when fitting these models, and produced simulated results that were skewed and assumed to misrepresent historical data.

Because of the historic nature of this event, and its impact on the economy, it is unknown what the long-term impacts of this pandemic will have on the economy. Numerous research articles have been produced to estimate or predict these long-term impacts (Chudik, 2020; Malliet, 2020).

Based on this research, the current state of COVID-19 cases, and an analysis of historical data, a randomized impact of the pandemic was applied.

As a result, two models were estimated, one basing estimates on pre-pandemic data, and the second including the pandemic data. A continued impact of COVID-19 on the economy of eighteen months to five years (six to 20 quarters) was applied randomly as a diminishing linear weight. The two model simulations were then combined using this weighting factor. Initially, the COVID-19 simulation is given the largest weight, and the weight slowly decreases over the randomized period of time until the COVID-19 simulations were given no weight, thus giving the the pre-COVID-19 simulations 100% of the weight.

Simulation Generation

Model fit was performed through an iterative process, varying parameter specifications for both ARMA and GARCH model components. Distributions were determined using standard distribution fitting techniques, including QQ-plots and Kolmogorov-Smirnov tests. Further parameter selection and distribution adjustments were made based on comparative analysis of simulations to historical series, providing the most reasonable estimates and simulations possible. One hundred simulations were generated for each of the economic variables. These variables were fully transformed back to the common form and scale as the original pre-transformed versions.

Interest Rate Simulations

Table 74 shows the summary statistics of the historical one-year CMT rates for two different periods as well as the simulated series. We can see that in the last 50 or more years, interest rates have had a much broader range as compared to the last 25 years.

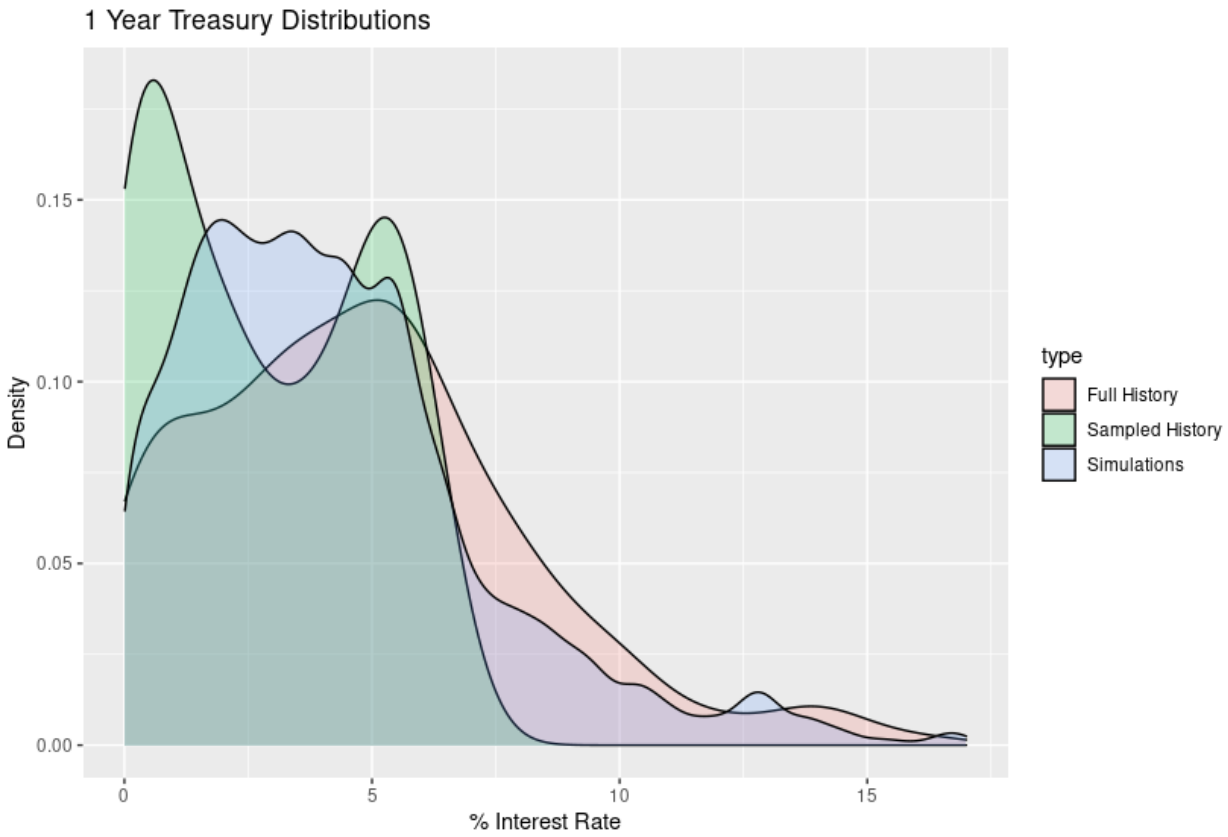
Table 74: Statistics for the One-Year Treasury Rates

STATISTICS	SINCE 1953	SINCE 1991	SIMULATIONS
95-PERCENTILE	10.29%	6.14%	10.29%
90-PERCENTILE	8.94%	5.70%	8.28%
50-PERCENTILE	4.60%	2.41%	3.79%
25-PERCENTILE	2.28%	0.57%	2.01%
10-PERCENTILE	0.51%	0.18%	0.90%

STATISTICS	SINCE 1953	SINCE 1991	SIMULATIONS
5-PERCENTILE	0.19%	0.13%	0.39%
MEAN	4.78%	2.84%	4.27%
MAX	16.31%	6.71%	17.00%
MIN	0.10%	0.10%	0.01%
VARIANCE	10.78%	4.71%	2.06%

Figure 66 shows density distributions, comparing the distribution of the historical treasury rates, historic sample used for simulations, and the distributions of all the simulations.

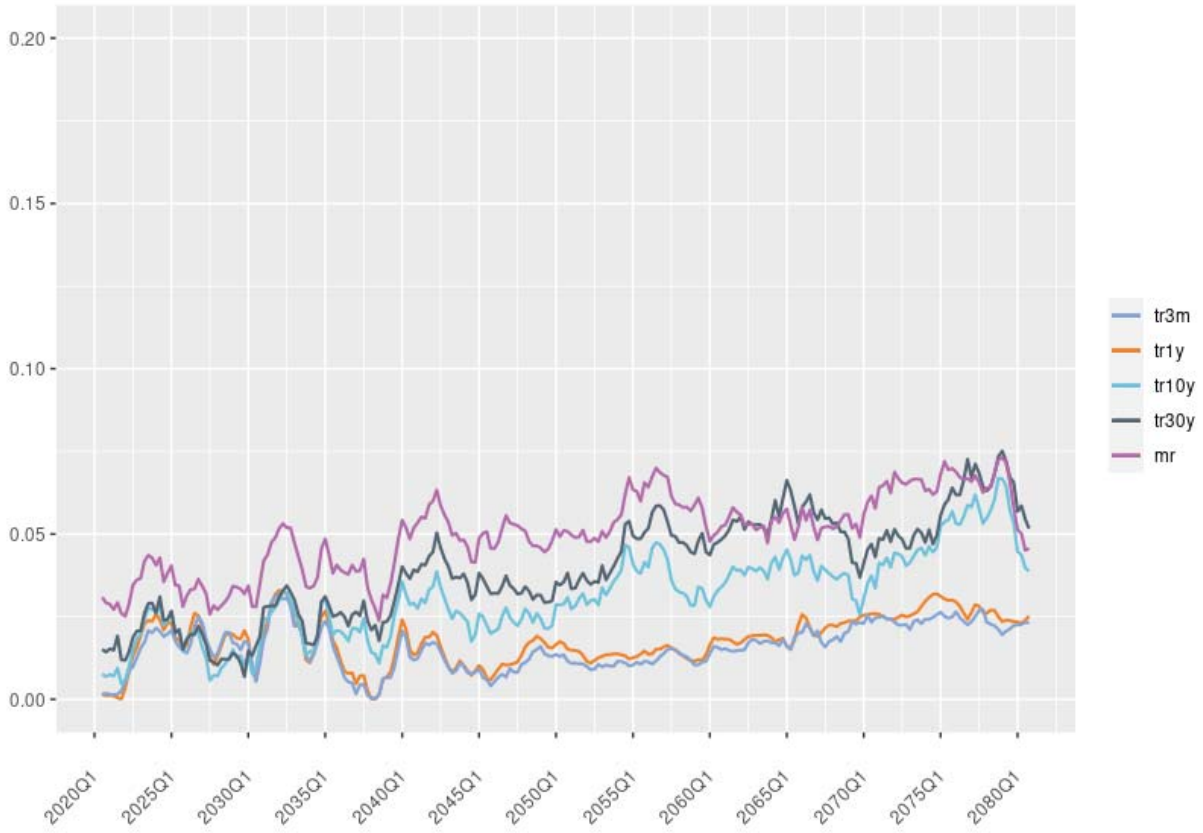
Figure 66: One-Year CMT Rate Densities, Historical and Simulations



To avoid negative interest rates, a lower bound of 0.01% was applied to all the simulated future interest rates.

Figure 67 graphs one of the one-hundred simulations, illustrating the co-movements and correlations between these variables and how the multivariate modeling method accounts for these interdependencies.

Figure 67: Interest Rate Sample Simulation



House Price Appreciation Rate

A. National HPA

The national HPA is calculated by first estimating and simulating HPI. From the HPI simulation, these simulations are then transformed using formula (1) to simulate HPA.

Table 75 provides comparison of simulated HPI average trends and the historical sample trends. The analysis show a significant spread between the series when comparing the largest and smallest trends, but when simulated trends are averaged across all series they are very close to the historical trend used in model fitting.

Table 75: HPI Simulation Statistics

	SIMULATED SERIES			HISTORICAL
	Max trend	Min trend	Mean trend	Trend
HPI	1.9411	1.2510	1.6392	1.8777

B. Geographic Dispersion

The MSA-level HPA forecasts were based on Moody's forecast of local and the national HPA forecasts. Specifically, at each time *t*, there is a dispersion ratio of HPAs between the *i*th MSA or State level and the national forecast:

$$Disp_{i,t}^{Base} = HPA_{i,t}^{Base} / HPA_{national,t}^{Base} \quad (6)$$

This dispersion forecast under Moody's base case was preserved for all local house price forecasts under individual future economic paths. That is, for economic path *j*, the HPA of the *i*th MSA at time t was computed as:

$$HPA_{i,t}^{j} = HPA_{national,t}^{j} * Disp_{i,t}^{Base} \quad (7)$$

This approach retains the relative current housing market cycle among different geographic locations and it allows us to capture the geographical concentration of FHA's current endorsement portfolio. This approach is also consistent with Moody's logic in creating local market HPA forecasts relative to the national HPA forecast under alternative economic scenario forecasts.[62]

We understand this approach is equivalent to assuming perfect correlation of dispersions among different locations across simulated national HPA paths, which creates systematic house price decreases during economic downturns and vice versa during booms. Due to Jensen's Inequality, this tends to generate a more conservative estimate of claim losses of the Fund.

Unemployment Rate

A. National Unemployment Rate

Table 76 provides statistics comparing series samples of unemployment rates to the simulated series

Table 76: Unemployment Historical and Simulation Statistics

STATISTICS	SINCE 1953	SINCE 1991	SIMULATIONS
95-PERCENTILE	9.13%	9.47%	10.77%
90-PERCENTILE	8.08%	8.68%	9.76%
50-PERCENTILE	5.53%	5.45%	6.37%
25-PERCENTILE	4.53%	4.61%	5.04%
10-PERCENTILE	3.69%	4.10%	4.30%
5-PERCENTILE	3.38%	3.82%	4.00%
MEAN	5.76%	5.89%	6.71%
MAX	12.42%	12.42%	15.79%
MIN	2.47%	3.33%	1.53%

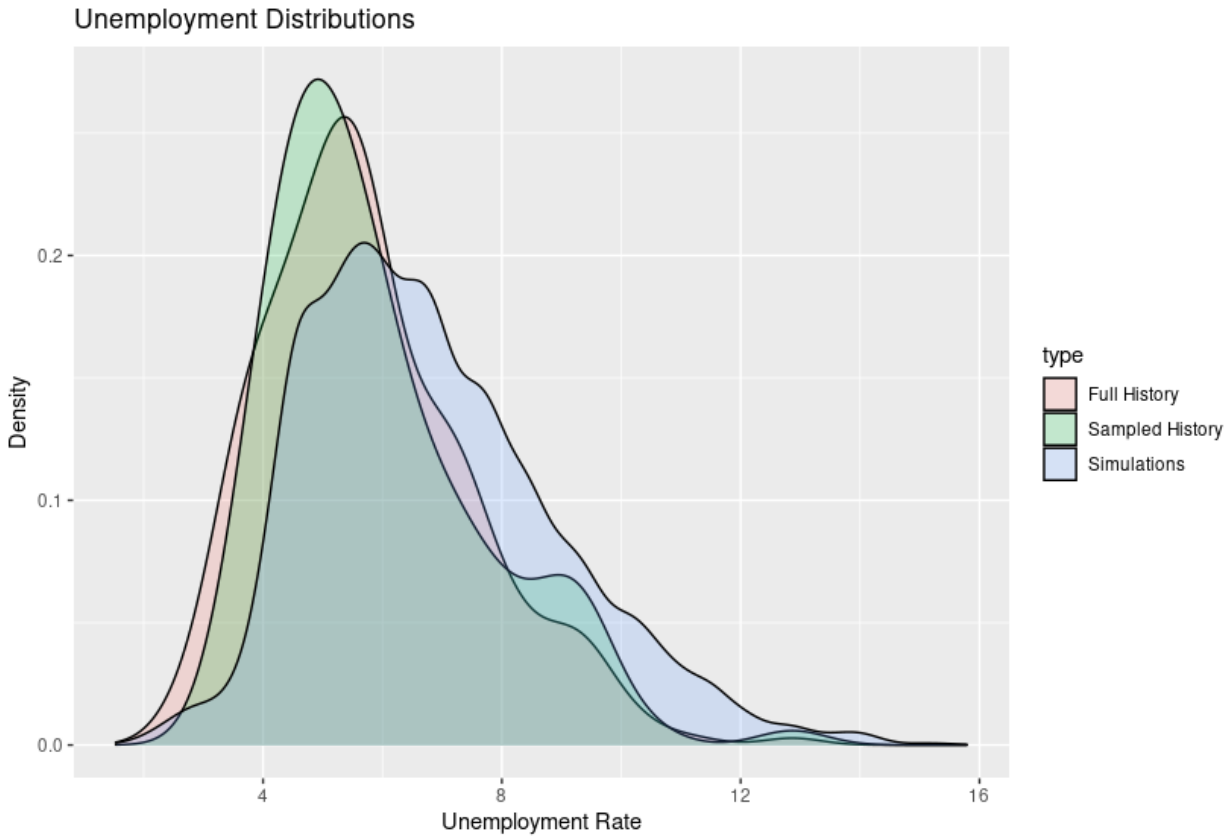
[62] The dispersion of each MSA remains constant among all alternative Moody's forecast scenarios.

STATISTICS	SINCE 1953	SINCE 1991	SIMULATIONS
VARIANCE	2.96%	3.06%	2.04%

Based on historical statistics, the national unemployment rate limits were set at a 20% maximum and a 2% minimum.

Figure 68 is a density plot comparison of the historical series and simulated sets.

Figure 68: Unemployment Rate Densities Historical and Simulations



B. Geographic Dispersion

Following the same logic that we applied to the MSA-level HPA forecasts, we first obtained the dispersion of unemployment rates between the i^{th} MSA or State level and the national level from Moody's July base-case forecast at each time t:

$$Disp_{i,t}^{Base} = ue_{i,t}^{Base} / ue_{national,t}^{Base} \quad (9)$$

This dispersion forecast was preserved for all local unemployment rate forecasts under each individual future

economic path. That is, for economic path *j*, the unemployment rate of the i^{th} MSA at time *t* was computed as:

$$ue_{i,t}^{j} = ue_{national,t}^{j} * Disp_{i,t}^{Base} \quad (10)$$

For the simulation, we capped the unemployment rate at the local level at 30% with a floor at 1%.

Gross Domestic Product

Table 77 provides statistics comparing the historical GDP series trend to simulated trends. The analysis show a fairly small spread between the series when comparing the largest and smallest trends, and when simulated trends are averaged across all series they are very close to the historical GDP trend used in model fitting.

Table 77: GDP Simulation Statistics

	SIMULATED SERIES			HISTORICAL
	Max trend	Min trend	Mean trend	Trend
GDP	2.921	1.742	2.215	2.430

Small Business Normalized Optimism Index/ Consumer Confidence Index

The small business and consumer confidence indices are based on a 100 point scale, where values under 100 represent less confidence in the economy, values over 100 indicate an increase in confidence.

Table 78: Confidence Indices Statistics

	HISTORICAL NOI	SIMULATED NOI	HISTORICAL CCI	SIMULATED CCI
MAX	142.11	177.35	108.18	122.21
MIN	29.86	24.61	82.73	65.89
MEAN	94.38	96.22	98.13	94.18

Table 78 provides comparisons of the range and means for both indices and the corresponding simulated data showing that the simulations provide reasonable ranges compared to historical data.

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Appendix E: Cash Flow Analysis

Introduction

The calculation of the Cash Flow NPV of the MMI involves the estimation of the present value of future cash flows generated by the existing portfolio. The analysis requires the projection of future prepayment and claim incidences, and severity and cash flow items associated with each type of outcome. The Cash Flow NPV represents future revenue and expenses associated with the existing book of mortgage guarantees. This appendix describes the components of these cash flow calculations.

To develop the estimated Cash Flow NPV, our model incorporates projections of mortgage performance and information about the existing portfolio composition to project the MMI's various cash flow sources. The cash flow projection model uses projections from predictive models as discussed in Appendix B (Transition Models), Appendix C (Loss Severity Models), and the economic scenarios described in Appendix D. We developed predictive models for conditional transition probabilities for individual mortgages depending on a number of mortgage and economic characteristics. From these models and using detailed mortgage-level characteristics, we estimated the various transition probabilities and then generated respective cash flows for individual mortgages.

Based on the mortgage termination rates projected by the predictive models, individual components of cash flows are projected into the future. These cash flows are discounted to present value based on the single discount rate provided by the OMB. Based on the specific characteristics of the mortgage, the probability of each transition is calculated. Then, a random number between 0 and 1 is generated, and based on this random draw a mortgage transition is determined. The projection process continues for each mortgage until the mortgage ends by prepayment, claim or reaches maturity.

The cash flow components are shown in the following table:

Table 79: Cash Flow Components

Cash Inflows	Cash Out Flows
Upfront MIP	Net Claim Payments
Annual MIP	Loss Mitigation Expenses
Interest Income	Refunded Upfront Premiums

These cash flows were projected quarterly for individual mortgages and then aggregated by product type and origination year. Below, we discuss the development of each of these cash flows.

Cash Flow Components

The components of cash flow are discussed below.

MIP

The primary source of revenue to the MMI is insurance premiums. If the MMI's mortgage insurance is priced to meet the expected liabilities, the MIP collected and interest earned on the MIP will cover all costs associated with mortgages insured by the MMI under a normal or expected economic environment. The MIP structure and the premium rates have changed over the period under evaluation. Details of MIP changes are as follows:

- For mortgages originated prior to September 1, 1983, the MIP was collected on a monthly basis at an annualized rate of 0.50% of the outstanding principal balance for the period. To align this change with fiscal quarters, we assumed that this annual MIP policy was in effect through September 30, 1983.

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

- Effective July 1, 1991, NAHA implemented a new MIP structure. An upfront MIP of 3.80% was charged for all product types except for 15-year non-SR mortgages, for which the upfront MIP was set at 2.00%. An annual MIP of 0.50% per year on the outstanding balance was also implemented. The annual MIP would cease at different years of maturity depending on the initial LTV of the mortgage.

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

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

- Starting from October 1, 1996, FHA lowered the upfront MIP rate on 30-year mortgages for first-time homebuyers who received homeowner counseling from 2.25% to 2.00%. This rate was further reduced to 1.75% for mortgages originated 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 MIP rate for all mortgages to 1.50%. The annual MIP would be discontinued as soon as the current LTV ratio of the mortgage was below 78% according to the home price as of the mortgage origination date. The annual MIP 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% for home purchase and full-credit qualifying refinances; and 1.50% for all types of streamline refinance mortgages. A varying annual

MIP, collected on a monthly basis, was charged based on the initial LTV ratio and maturity of the mortgage.

- Effective April 1, 2010, FHA changed the upfront MIP to 2.25% for all mortgages executed after April 1, 2010.

- Effective October 4, 2010, FHA lowered the upfront MIP of all mortgages to 1.0%. The annual MIP for mortgages with 30-year terms was increased to 0.85% for LTV ratios up to 95 percent and to 0.90% for LTV ratios greater than 95%. For mortgages with 15-year terms, an annual MIP of 0.25% was set for LTV ratios greater than 90%. To align this change with fiscal quarters, we started applying this policy change on October 1, 2010.

- Effective April 18, 2011, the annual MIP for mortgages with 30-year terms was increased to 1.10% for LTV ratios up to 95% and to 1.15% for LTV ratios greater than 95%. For mortgages with 15-year terms, the annual MIP was increased to 0.25% for LTV ratios up to 90% and to 0.50% for LTV ratios greater than 90%. To align this change with fiscal quarters, we started applying this policy change on April 1, 2011.

- Effective April 9, 2012, FHA increased the upfront MIP of all mortgages to 1.75%. The annual MIP for mortgages with 30-years terms was increased to 1.20% for LTV ratios up to 95%, and to 1.25% for LTV ratios greater than 95%. For mortgages with 15-year terms, the annual MIP was increased to 0.35% for LTV ratios up to 90%, and to 0.60% for LTV ratios greater than 90%. To align this change with fiscal quarters, we started applying this policy change on April 1, 2012.

- Effective June 11, 2012, the annual MIP for mortgages with 30-year terms and base mortgage amounts above $625,500 was increased to 1.45% for LTV ratios up to 95%, and to 1.50% for LTV ratios greater than 95%. For mortgages with 15-year terms, and base mortgage amount above $625,500, the annual MIP was increased to 0.60% for LTV ratios up to 90%, and to 0.85% for LTV ratios greater than 90%. Also effective June 11, 2012, for all single family forward SR mortgages which are refinancing existing FHA mortgages that were endorsed on or before May 31, 2009, the upfront MIP decreased to 0.01% of the base mortgage amount, and the annual MIP was set at 0.55%, regardless of the base mortgage amount. To align this change with fiscal quarters, we started applying this policy change on July 1, 2012.

- Effective April 1, 2013, the annual MIP for mortgages with 30-year terms and base mortgage amounts below $625,500 was increased to 1.30% for LTV ratios up to 95%, and to 1.35% for LTV ratios greater than 95%. The annual MIP for mortgages with 30-year terms and base mortgage amounts above $625,500 was increased to 1.50% for LTV ratios up to 95%, and to 1.55% for LTV ratios greater than 95%. For mortgages with 15-year terms and base mortgage amounts below $625,500, the annual MIP was increased to 0.45% for LTV ratios up to 90%, and to 0.70% percent for LTV ratios greater than 90%. For mortgages with 15-year terms and base mortgage amounts above $625,500, the annual MIP was

increased to 0.70% for LTV ratios up to 90%, and to 0.95% for LTV ratios greater than 90%. This increase was effective for all forward mortgages except single family forward SR transactions that refinance existing FHA mortgages that were endorsed on or before May 31, 2009.

- Effective June 3, 2013, the annual MIP rates for mortgages with an LTV of less than or equal to 78% and with terms of up to 15 years was 0.45%. The new payment period for annual MIP for mortgages with case numbers assigned on or after June 3, 2013 and with an LTV up to 90% was 11 years, and the annual MIP applied for the life of the mortgage for LTVs greater than 90%. To align this change with fiscal quarters, we started applying these policy changes on July 1, 2013.

- Effective January 26, 2015, the annual MIP rates for mortgages with a term greater than 15-years have been reduced by 50 basis points. To align this change with fiscal quarters, we applied these policy changes on January 1, 2015.

Upfront MIP

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

*Upfront MIP = Origination Mortgage Amount * Upfront MIP Rate*

In practice, FHA allows qualified homeowners to finance the upfront MIP so that the upfront MIP does not add to the borrower's equity burden at the beginning of the contract. Instead, the borrower can add the upfront MIP to the original mortgage balance, in essence paying the upfront MIP on the same schedule as their principal balance. The annual MIP is charged based on the unpaid principal balance excluding the financed upfront MIP. Almost all borrowers finance their upfront MIP in this fashion. However, the LTV including refinanced upfront MIP cannot exceed 96.5%.

Annual Premium

The annual MIP is calculated as follows:

*Monthly MIP = UPB (excluding any upfront MIP) * Annual MIP Rate / 12*

The MIP is actually collected on a monthly basis. For purposes of the simulation, the monthly MIP is aggregated by quarter, and this quarterly premium is used to discount MIP for the simulation.

Refunded MIP

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

*Refund Payments = Original UPB * Upfront MIP Rate* Refund Rate*

Refund payments at each quarter are calculated based on the number of mortgages prepaid in that quarter and the origination date of the mortgage. In the past, borrowers always received the upfront MIP refund when they prepaid their mortgages before the maturity of the mortgage contract. In 2000, FHA changed its policy so that borrowers would obtain refunds only if they prepaid within the first five years of their mortgage contracts. The most recent policy change at the end of 2004 eliminated refunds for early prepayments of any mortgages endorsed after that date, except for those borrowers who refinanced into a new FHA mortgage within three years following the original endorsement date.

Losses Associated with Claims

The MMI's largest expense component comes in the form of payments arising from claims. FHA pays the claim to the lender after a lender files a claim. Traditionally, 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 (REO).

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

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

We have estimated the net loss as discussed in Appendix C separately for PFS, TPS and REO. Based on the specific characteristics of the mortgage, the net loss for each claim is calculated. Then, a random number between 0 and 1 is generated, and based on this random draw the predicted net loss is determined.

Loss Mitigation Expenses

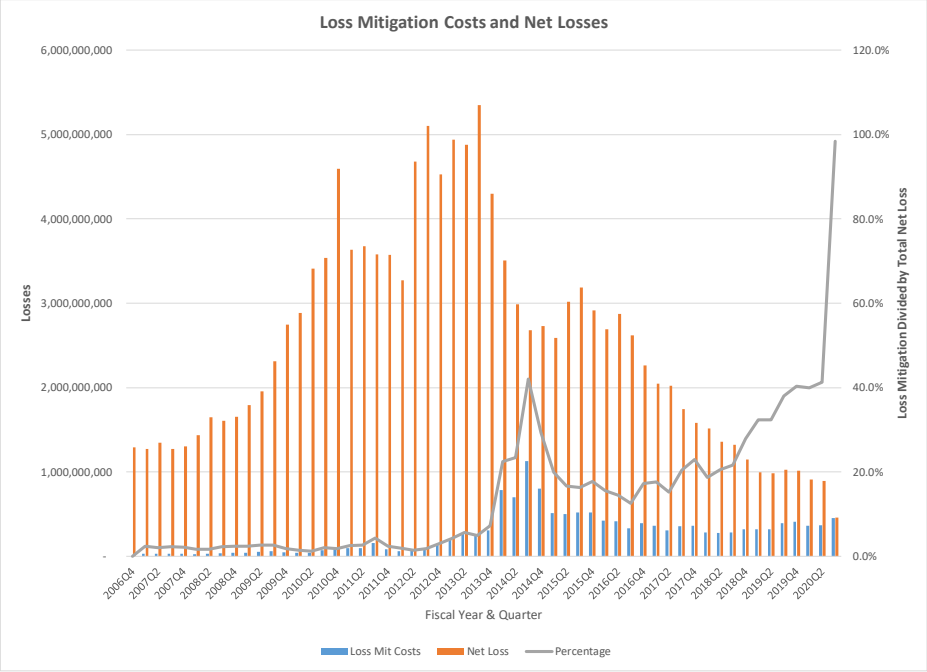
FHA initiated a loss mitigation program in 1996 in an effort to provide opportunities for borrowers in financial difficulties to retain homeownership. Loss mitigation also reduces foreclosure costs. In the standard process, the mortgagees provide default counseling for borrowers who are behind in their payments, and offer appropriate loss mitigation options to prevent borrowers from losing their homes. In 2009, FHA started the HAMP program as a new loss mitigation option, and the program represented increasing percentages of loss mitigation assistance through the years. In 2016, Mortgage Modification as a standalone option was eliminated and combined into HAMP.

The loss mitigation program includes Forbearance and HAMP, which has Loan Modification and Partial Claim options. A Special Forbearance is a written repayment agreement between the mortgagee, acting on behalf of FHA, and the borrower that contains a plan to reinstate a mortgage. A Loan Modification modifies the contractual terms of the mortgage permanently, such as lowering the interest rate, or increasing the mortgage term. Under the partial claim option, a mortgagee will advance funds on behalf of a mortgagor in an amount necessary to reinstate a delinquent mortgage. The borrowers are required to sign a promissory note and a

subordinated mortgage payable to FHA of the amount advanced.

Figure 69 shows the ratio of loss mitigation costs to overall net losses. Loan mitigation cases increased significantly from Fiscal Year 2007 to Fiscal Year 2014. There were just under 80,000 loss mitigation claims in Fiscal Year 2007 which grew to over 180,000 cases in Fiscal Year 2014. The amount FHA paid in these cases and curtailments was $116 million in Fiscal Year 2007, which increased to $3.41 billion in Fiscal Year 2014. From 2014 to 2018, loss mitigation payments decreased to $1.16 billion, but then increased in 2019, and are projected to increase again in 2020. For the second quarter of 2020, loss mitigation payments account for 98% of all claim payments. This is due to the COVID forbearance rules that were implemented on March 1, 2020. All foreclosure proceedings have been halted, and no new foreclosure proceedings can begin until 2021. Therefore, the non-loss mitigation claims will be delayed until normal foreclosure and claim processes can resume. Loss mitigation payments made by FHA include administrative fees and costs of title searches, recording fees and subordinated mortgage note amounts.

Figure 69: Loss Mitigation Expense



As discussed in Appendix C, we have developed models to project loss mitigation expenses.

Net Present Value

Once all the above future cash flow components are estimated, their present value is computed by discounting them at an appropriate rate. The discount factors applied were provided by FHA and reflect the OMB discount factors and the expected timing of future cash flows. The rates are constant and vary by mortgage cohort year. The discount factors reflect the most recent Treasury yield curve, which captures the federal government's cost

of capital in raising funds. These factors reflect the capital market's expectation of the consolidated interest risk of U.S. Treasury securities. Our simulations aggregated each future year's cash flows by quarter, and treat the cash flows as being received at the end of the quarter.

Appendix F: Review of HUD Analysis of Economic Net Worth, Comparison of HUD and Pinnacle Models, and Assessment of Vulnerabilities

Appendix F presents a high-level review of HUD models developed to project Economic Net Worth, compares the models developed by HUD with the models developed by Pinnacle, and assesses the vulnerabilities of the models developed. We have also identified potential areas of future research based on this assessment.

Deliverable 4 of the Actuarial Report states:

> ***To promote transparency of the Studies' assessments, the Studies should identify methodological vulnerabilities that may occur in its actuarial models or in HUD's analyses of Economic Net Worth. This discussion should evaluate the scope and scale of such vulnerabilities in creating possible forecast risk and suggest possible lines of research in these areas. The Studies shall assess and comment upon HUD's own models that estimate Economic Net Worth for methodological vulnerabilities and compare HUD's methodologies with those in the Studies.***

There are several different aspects of forecast risk that can arise in the projection of Economic Net Worth, including:

- Process risk— actual results vary from projected results due to variability in the mortgage insurance process
- Parameter risk— the uncertainty related to the parameters selected for a given model
- Specification risk— the uncertainty related to the type of model that is selected for a forecast

The following discussion comments on these various types of forecast risk.

Forward Budget Model Commentary

Summit-Milliman (S-M) has developed a series of models consisting of the Single Family (Forward) Budget Model Schema that are used to forecast cash flows for the Forward mortgages in the FHA portfolio. The following discusses strengths and potential vulnerability of these models, as well as identifies potential areas for further research.

Model Schema

The Loan Performance Models consist of a Stage 1 model for loans that have never been seriously delinquent and a Stage 2 model for loans that have experienced a 90-day delinquency. Both models are used to predict the likelihood of a given loan becoming seriously delinquent or prepaying. This is reasonable as the two sub-populations exhibit different future transition behaviors.

The Stage 1 model uses a series of binomial logistic cell regressions to estimate the probabilities for non-claim termination and serious delinquency, incorporating the assumption of Independent Irrelevant Alternatives (IIA). The IIA assumption states that adding or removing termination events does not impact the odds of the original

termination event. This is a potential vulnerability of the models if this assumption is violated. However, to the extent this assumption holds, then the S-M approach is mathematically equivalent to a multinomial logistic model, which would be a reasonable approach given the number and type of outcomes being predicted.

S-M built two Stage 1 models, one for purchase loans and one for refinance loans, as they exhibit different prepayment rates. This is also appears to be a reasonable assumption based on our independent analysis of purchase and refinance loans.

The Stage 1 models were built using cell regression, which aggregates the loans into unique groups using combinations of values of 20 different variables. The purpose of this method is to maximize the amount of data used to build the model while minimizing the required computing capacity. This is different than Pinnacle's approach where the models were built on an individual loan level. S-M noted that there were only minimal changes to the current models as compared to the prior FY2021.1 versions. Specifically, S-M updated the spline knots for the Stage 1 Purchase Prepay Loan size relativity variable. This is reasonable, and also similar to Pinnacle's approach of making updates to placement of knots based on updated data.

There are some potential vulnerabilities in the S-M modeling approach, which are acknowledged by S-M as well:

- The models were developed using a long period of data (1990-2019). For Stage 2 loss mitigation models, delinquencies from 2009 and subsequent were used. This may cause slower reflection of shorter term trends. As Pinnacle uses data from the beginning of the Forward Mortgage Guaranty program, this is potential vulnerability in the Pinnacle models as well.

- Only the Stage 2 model is used for a loan once it is 90 days delinquent, which can fail to fully reflect short-term changes if a loan quickly self-cures, for example.

- The historical data may not be reflective of future performance or of program changes. Again, these are potential shortcomings in the Pinnacle models as well. See section below regarding S-M adjustments due to COVID-19 impacts.

- Other significant changes in economic conditions, such as in unemployment as has been seen recently due to the COVID-19 pandemic, may not be fully or adequately reflected in the model results.

For these vulnerabilities, but in particular the first one, one area of potential future research is to refit the models on more recent data and evaluate the change in the model parameters. Also, results of the model could be validated against more recent data to test how well the models reflect more recent experience. One approach that Pinnacle has incorporated to account for this vulnerability is to include credit subsidy cohort and loan period as variables in the models. An additional research step would be to test the interaction of these time related elements with other independent variables in the models.

The Stage 2 Loan Performance Model was developed on a loan level basis. Due to different claim rates, S-M built

two Stage 2 models depending on whether the loan received loss mitigation in the past or not. Once a loan enters a Stage 2 model it cannot revert back to Stage 1. The models used multinomial logistic regression given the number and type of different potential outcomes. S-M evaluated the structure and appropriateness of the Stage 2 models but did not make any updates from the prior FY2021.1 models.

S-M used a few approaches to validate their Stage 1 and Stage 2 Loss Performance Models, including out-of-sample actual vs. expected results, Receiver Operating Characteristic (ROC) curves, and comparison of claim rates for loans that did or did not receive loss mitigation. S-M also reviewed the variable significance levels for the models. All of these are reasonable approaches. An additional approach to consider would be to use out of time data to validate the models, however if more recent data was left out of the initial model development, it would potentially increase the likelihood of shorter-term trends being missed.

The Loss Mitigation Models developed by S-M have two parts for Stage 2, one for loans with loss mitigation applied and one for loans without loss mitigation. This is done since the probabilities of claim vs. non-claim termination vary greatly depending on if a loan receives loss mitigation or not, and is consistent with the S-M approach for Stage 2 Loan Performance Models. However, due to changes in government programs and frequency of mitigation usage over the years, S-M notes there may not be enough data to develop a reliable model to predict which delinquent loans will receive loss mitigation. Therefore, actuarial methods were used to project these rates. S-M selected a 38% loss mitigation rate for the current models based on updated data which was a slight decrease from the 40% rate selected for the prior FY2021.0 models. While it is reasonable to use actuarial methods in this case, this does introduce an additional potential source of uncertainty in the results. Also, it is not clear what testing that S-M did to conclude there was not enough data to develop a loss mitigation prediction model. Future research could involve attempting to build models on the data that does exist and comparing the model results to recent actual results to determine if the accuracy is sufficient.

The Loss Severity Models developed by S-M predict the disposition and severity of a loan loss from Stage 2 in two parts. The disposition estimation model predicts the probability of a loan entering a specific disposition path (PFS, Single Family Loans Sales [SFLS], CWCOT, or REO). The loss severity model predicts the amount of loss given a default. The disposition model uses a waterfall approach.

The model first uses binomial logistic regression to estimate the probability of a PFS vs. other type of disposition. Data from 1995 and forward was used. Due to lower data volume, historical data from January 1, 2018 to January 1, 2020 is then used to determine if a non-PFS is estimated to be either a SFLS or CWCOT. Finally, the conditional probability for REO is simply the remaining proportion of claims since it is the end of the process waterfall. Potential future research could be to test the two-year period for historical data to determine whether two years of data is sufficient, or to demonstrate how sensitive the results are to different lengths of time. Similarly, CWCOT severity, SFLS severity, and SFLS sales price are determined using this same two-year period. Future analysis should be considered to validate this length of time and its impact on results. Pinnacle uses the entire data history to build models determining the likelihood of an REO or TPS claim.

With the current models, S-M made methodological changes to PFS and REO loss severity estimation by

eliminating the econometric estimation of acquisition cost components and instead used a historical distribution method. Also, they updated the variable specification for PFS disposition regression, the PFS Sale Ratio regression, and the REO Sale Ratio regression with the current models. These changes were made to improve the fit and performance of the models. S-M validated their models using comparisons of out-of-sample actual-to-expected results by termination quarter, claim rates for all loans, and of the log of loss for REO and PFS claims. Also, they found that estimates produced by the models are consistent with historical experience. All of these methods are reasonable approaches to validation.

These three models (Loan Performance, Loss Mitigation, and Loss Severity) combine to produce cash flows to then calculate Liability of Loan Guarantee (LLG) and Return on Assets.

S-M then estimates acquisition costs separately from Net Loss using Ordinary Least-Squares (OLS) regression. They also estimate sale ratio using linear regression, whereas previously the ratio was calculated from sales price. While these can be improvements in sophistication of the modeling and results, this can also now add additional uncertainty from the additional model parameters.

With the prior (FY 2021.1) model version, S-M introduced a 2.0% Quarterly Prepayment Rate Floor. While this could introduce some future variability in the results particularly considering the current economic conditions, S-M tested the selection using historical data to determine a reasonable floor, and also tested results with different (including no) floors. This was also the result of S-M's discussion with FHA on a reasonable prepayment rate floor to use. Note that as described below that due to COVID-19 impacts, S-M has increased the rate to 3.5% to reflect the recent increase in pre-payment activity.

S-M's process for selecting variables is reasonable. This process included performing exploratory data analyses and univariate analyses to better understand the data. Specifically, S-M reviewed how well a variable was populated, how the variable changes over time, and how well the variable relates to the target. S-M also considered collinearity between variables. Univariate regression analysis and backward selection stepwise regression were used, with a p-value threshold of 10% to determine which variable to include in the stepwise procedure. S-M also ran models across time to assess model stability. Splines were added to various models to improve performance, with the c-statistic measured to determine impact. Finally, when considering whether to include a variable in a model, S-M considered the intuitive relationship of the model variables and the predictive nature of the variable.

S-M notes that several variables such as credit score, borrower income, debt-to-income ratio, and loan-to-value ratio have an influence on mortgage performance yet are censored or have missing data in the datasets for various reasons. S-M made an explicit adjustment on the credit data to back-populate it, as is described in more detail below. An area for further research would be determining if there are additional sources to better populate other types of variables for which a significant portion of the data is missing.

There are several additional potential areas for future research/testing of assumptions.

- The S-M report notes that the majority of FHA's endorsement volume is from post-2007 credit subsidy cohorts, and as a result, the data for the cohorts is not fully developed. The implicit assumption is that these younger cohorts will perform similarly to older cohorts. As more data is obtained over time, this assumption should be tested, and appropriate adjustments made if any differences in performance are seen.

- The report noted that the FHA to FHA refinance rate changed from 25% to 20% from the prior (FY2021.0) to the current (FY2022.0) model version due to the declining trend observed since 2015. It should also be noted that the refinance rate was decreased from 35% used for the models prior to FY2021.0 versions. The sensitivity of the results to this change should be further explored since the change in the refinance rate is significant.

- The payment reduction factor used from the prior to the current version of the model changed from 22.5% to 15% due to the mean and median observed percentages that varied from 12.7% to 26.7% observed from 2013 through 2019 and the declining rate trend. The report also noted that the factor has varied substantially over the past several years. The sensitivity of the results to this change should be further explored given the variation that has been seen in this parameter over time.

- The results use a two-year lookback period for the Return on Properties calculation. While not necessarily unreasonable, further exploration of different lookback periods and support for the two-year selection would be a reasonable approach to validate the selection.

Following are some additional sources of potential vulnerabilities in the methodology.

- Declining vs. Increasing Interest Rate Environment—while noted in the report, the historical data used in model development was collected in a generally declining interest rate environment. However, the forecast is for interest rates to increase. This introduces a potential source for uncertainty in the results since the historical data is not necessarily reflective of loan performance in the future expected interest rate environment.

- Sensitivity tests performed on HPA and interest rate factors assume independence of factors and so may impact the results that would actually be seen with multiple varying parameters.

- S-M selected 2012-2019 cohorts due to volume and availability of actual historical cashflows for performing back-testing of their model results. This is a different approach than taken with last year's study where 1992, 1999, and 2006 were the only years selected. While this is not unreasonable, this could be a potential source of variability in results if different cohort years were selected.

- During the discussion of their modeling methodology, S-M notes that they built the Loan Performance

and Loss Severity models on 80% of the data and validated them on the remaining 20% as an out-of-sample holdout. This is a reasonable approach. However, S-M did note that after they validated the performance of the model, they re-estimated it on 100% of the data. One potential vulnerability in this approach would be a significant change in the estimated model parameters between the 80% fit and the 100% fit. S-M did do such a validation comparison for the Loss Severity Models, with overall results looking reasonably similar.

- There are multiple models being used in combination, so there is the risk of error propagation across the multiple models.

COVID-19 Impact Adjustments:

S-M made several adjustments to models due to expected impacts from COVID-19. These adjustments appear to be reasonable based on available data.

- Increase Roll Rates to Reflect COVID—30 and 60-day delinquency roll rates were developed to estimate the population of 90+ day delinquencies using data from the 2008-2011 financial crisis as guidance. This was only a temporary adjustment until September 2020 data was available.
- Increase Loss Mitigation rates to Reflect COVID—rates were increased for loans that have utilized forbearance based on data that shows delinquent loans during COVID that have used forbearance are more likely to also use loss mitigation.
- Implement Revised Loss Mitigation Waterfall—the waterfall pattern was updated based on mortgagee letter 2020-22 that was issued in July 2020.
- COVID PC Payments and Timing—S-M selected a multiplier of 6 for each loan's monthly PITI based on assumed number of missed payments for a 6-month forbearance period per mortgagee letter 2020-22. Also, S-M included an assumption that COVID PC payments will occur in Q1 of FY2021 with recoveries occurring with Stage 2 NCT events. Loans ineligible for the COVID PC will follow standard loss mitigation timing and be dependent on the HAMP loss mitigation module.
- Higher near-term Prepayment rates to Reflect Low-Interest Rate Outlook—S-M has adjusted the three month prepayment floor from 2.0% to 3.5% to be in place through the end of FY2021 based on observed rates over the past 12 months.

Through their analysis of the data, S-M recognized that the credit score is a very important component of prediction, and also that a significant amount of credit scores were missing for loans prior to 2004 due to how the FHA program was administered. Therefore, S-M attempted to supplement the credit score data from additional sources. One source was a study completed by Fannie Mae, but upon review of the data that approach still resulted in a significant number of missing scores. Next, loan level data was then appended from a CoreLogic source. S-M compared aspects of this data to the existing scores for a time period that overlapped between the CoreLogic and FHA data (2005-2013) and determined that it was reasonable to use based on the average credit scores by year for each of the datasets. Based on Pinnacle's review of the summary statistics of

the data, while this is not an unreasonable approach to take to supplement missing credit scores, some degree of caution should be exercised since there is a significant difference in the average credit scores between the two sources, with the CoreLogic source showing higher scores. To help account for this, S-M included an indicator for score source in the models, which is reasonable.

Pinnacle Forward Budget Model Commentary

The following illustrates some of the similarities and differences in methodologies for the Forward budget models between the Pinnacle analysis and that done by S-M for HUD.

The Pinnacle models analyzed the forward book of loans based on separate products: 30-year FRM, 15-year FRM, refinances, and ARM. The S-M approach did not build models separately by product beyond the purchase loans vs. refinance loans for their Stage 1 model. Also, the Pinnacle models were built on an individual loan level. S-M used individual loans for their Stage 2 models but grouped the data (cell regression) for their Stage 1 models.

Model Schema

The schema of the models is different between the S-M process and that of Pinnacle. Both reflect models for Performing (Stage 1 or Current) vs. Non-Performing (Stage 2 or Default) loans. Pinnacle further develops separate models based on product (FRM30, FRM15, ARM). The HUD models predict the likelihood of prepayment or delinquency from each of the Stage 1 or Stage 2 starting points. Pinnacle's models reflect potential transition to multiple states.

- Transitions from Current mortgage: remain current, default/claim, prepay by SR, other prepayments, cure with mortgage modification, self-cure

- Transitions from Default mortgage: prepay, transition into a claim, self-cure, cure with mortgage modification, remain in default

Transition models for Pinnacle are used to project how a loan will move to a different status. Loss Severity Models are used to project the amount of loss given a claim.

Regarding the modeling process, for this year's analysis Pinnacle has continued to use multiple binomial models for the Forward transition models. Pinnacle researched reverting to a multinomial model but found no significant differences in the resulting parameter estimates, and thus decided to continue the same process.

The main vulnerability in the models is the general vulnerability of developing predictive models: the extent to which historical patterns between target and projected results are indeed predictive. We have attempted to mitigate this potential vulnerability through a training and validation construct. For the Transition Models, we use 60% of the data to train the models and 40% of the data to validate the models. This is different than the split percentages used by S-M. For the Loss Severity Models, a train/validate approach also was used. Pinnacle did not do any out of time sample validation.

Pinnacle models were validated in general by comparing actual to predicted results in decile charts. This was done for both the transition models and loss severity models.

Pinnacle applied random sampling for a few of the Current transition model types to improve efficiency of the modeling process. This could be a potential source of variability if not truly random, and a future area of refinement could be to test to see if using different sampling percentages result in a difference in the model results. Pinnacle did use the full data sample on many more of the transition model types with this analysis than in past reports.

For Loss Severity models, Pinnacle built a multinomial logistic model to predict claim disposition—PFS, REO, or CWCOT. S-M also included the Single Family Loan Sales (SFLS) as a type. Pinnacle also built models to predict loss severity (using Generalized Linear Models with a Gamma error structure and a log link function) for each of PFS, REO, and CWCOT, as well as a model for recovery amounts if the claim is a foreclosure REO. S-M does not separately specify a recovery amount model. Finally, Pinnacle also modeled loss mitigation costs.

S-M utilized data from Moody's in their loan projections. Pinnacle uses 10 economic scenarios from Moody's, and 100 random stochastic simulations of key economic variables to develop a range of Cash Flow NPV. Both S-M and Pinnacle utilized Moody's data on a state and MSA level when possible to provide for a greater reflection of differences in home prices, etc. across the country.

Simulation

Pinnacle ultimately utilized 100 random stochastic simulations to determine the range of Cash Flow NPV estimates. This compares to the S-M process which used 10,000 Monte Carlo simulations. Pinnacle developed simulations of key economic variables as inputs into the Cash Flow NPV simulations, while the S-M process used 10,000 simulations of target variables (default rate, prepayment rate).

Appendix G: Summary of Historical and Projected Claim Rates, Non-Claim Termination Rates and Loss Severities

The following incremental annual summaries are shown by cohort for Fixed Rate 30, Fixed Rate 15, ARM products separately, and for all products combined.

1. **Conditional Claim Rate**: percentage of active Loans at the beginning of the evaluation year that end in claim during the evaluation year

2. **Cumulative Claim Rate**: cumulative claims as of evaluation year divided by active loans as of evaluation year 1

3. **Conditional Non-Claim Termination Rate**: percentage of active loans at the beginning of the evaluation year that end in termination by other than claim during the evaluation year

4. **Cumulative Non-Claim Termination Rate**: cumulative non-claim terminations as of evaluation year divided by active loans as of evaluation year 1

5. **Conditional Loss Rate**: claim cost net of recovery in each evaluation year divided by gross claim cost in each evaluation year

6. **Cumulative Loss Rate**: total losses net of recovery for each Fiscal Year as of the end of the evaluation year divided by total gross losses for each Fiscal Year as of the end of the evaluation year

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Active Loans
All Products Combined

Table 1: Number of Loans Active at the End of Each Evaluation Year

	Evaluation Year																														
Fiscal Year	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	31
1990	716,290	699,744	622,676	427,200	291,370	258,835	219,891	191,998	155,928	122,759	107,525	91,993	73,780	56,823	45,483	36,835	29,664	26,906	24,997	23,260	21,724	20,382	19,323	18,225	17,039	15,749	14,679	13,599	12,110	9,538	703
1991	620,371	589,526	447,493	315,815	284,235	242,682	211,870	169,597	131,701	115,109	96,760	75,636	55,955	43,785	36,211	27,917	24,990	23,064	21,347	20,169	18,710	17,672	16,675	15,702	14,687	13,592	12,621	11,560	10,328	8,204	0
1992	608,925	558,347	469,057	432,902	379,282	335,760	269,995	208,013	182,213	150,689	113,807	77,585	58,280	47,011	38,851	31,576	28,426	26,313	24,591	23,046	21,428	19,981	18,635	17,318	15,910	14,459	13,101	11,675	10,123	8,907	789
1993	952,961	889,866	841,547	762,357	689,234	582,275	470,236	415,387	346,858	263,988	167,003	121,538	95,758	78,456	66,489	51,344	46,602	43,040	39,999	37,157	33,579	31,063	28,571	26,182	23,762	21,220	19,038	16,877	15,427	13,349	1,391
1994	1,096,099	1,058,814	970,203	883,186	751,018	618,524	549,226	462,248	361,035	238,263	175,508	138,834	114,738	98,524	83,437	66,584	61,601	57,326	53,279	48,683	44,156	40,885	37,492	34,260	30,953	27,621	24,937	22,932	21,080	17,261	1,047
1995	499,588	459,931	415,493	327,884	256,444	224,459	183,205	138,907	93,214	67,690	52,273	42,651	36,488	32,710	29,766	26,364	24,724	23,287	21,727	20,390	18,899	17,520	16,193	14,971	13,787	12,645	11,659	10,694	9,616	8,207	957
1996	756,657	726,280	595,377	466,701	410,632	333,433	250,939	163,230	116,388	88,810	71,938	61,442	54,854	50,220	46,024	40,974	38,375	35,642	33,293	30,975	28,508	26,352	24,414	22,599	20,901	19,109	17,567	15,880	14,293	12,349	1,452
1997	746,980	660,692	514,291	449,658	353,161	263,340	171,722	122,299	92,783	74,855	63,681	56,823	52,386	48,773	45,438	41,204	38,235	35,814	33,396	30,932	28,358	26,264	24,386	22,706	20,884	19,182	17,426	15,872	14,473	12,795	1,658
1998	982,751	899,554	829,750	703,905	543,409	331,098	226,476	167,246	134,177	114,193	101,669	92,411	85,123	78,796	72,474	63,347	58,442	53,991	49,529	45,366	41,514	38,487	35,651	32,617	29,833	26,719	24,130	21,917	19,943	17,734	2,818
1999	1,122,394	1,083,590	926,576	710,180	438,103	300,537	220,358	176,325	149,974	133,417	121,111	111,556	102,972	94,786	84,703	74,489	68,484	62,717	57,426	52,814	48,615	45,053	41,509	38,262	34,705	31,177	28,457	26,204	24,015	21,068	2,153
2000	801,986	604,187	399,394	240,120	161,401	115,733	90,097	74,817	65,769	59,813	55,127	51,483	47,998	43,993	40,664	37,000	33,976	31,396	29,065	27,144	25,270	23,521	21,895	20,120	18,412	16,947	15,687	14,480	13,298	11,561	1,501
2001	1,035,720	854,844	488,931	322,307	229,199	179,674	151,031	133,024	118,742	108,101	99,452	91,309	81,565	74,551	67,892	60,339	54,943	50,727	47,220	44,042	40,488	37,543	34,633	31,887	29,492	27,370	25,380	23,491	21,702	19,600	3,323
2002	1,082,578	734,761	517,432	376,809	299,445	251,937	222,334	197,182	178,432	163,252	148,164	129,679	117,324	105,941	94,728	81,841	74,652	68,956	64,036	59,514	54,761	50,709	47,176	44,306	41,678	38,929	36,446	34,062	31,592	28,192	4,592
2003	896,901	744,226	574,569	471,579	406,649	365,749	329,667	299,983	274,357	245,782	207,656	185,631	165,768	146,950	128,900	109,695	100,695	92,214	86,464	82,027	75,336	71,500	68,211	65,221	62,252	57,951	55,084	52,215	49,216	45,525	76
2004	845,956	689,516	572,384	492,535	442,972	399,664	364,202	334,569	300,561	254,090	226,792	203,106	181,091	161,028	141,692	125,105	114,992	107,732	102,047	95,920	88,236	84,147	80,534	77,017	73,106	67,934	64,460	61,044	57,661	44,319	161
2005	457,885	410,348	362,569	327,521	296,128	269,627	247,381	221,054	184,439	163,674	145,309	129,104	115,124	104,046	94,169	83,825	79,227	75,976	72,821	69,736	65,181	63,013	60,981	58,850	56,562	52,990	50,873	48,680	46,409	40,776	154
2006	393,444	363,265	325,584	279,768	247,190	222,401	193,800	156,001	135,239	117,875	103,145	91,166	82,116	75,082	68,470	62,958	60,081	57,326	54,797	52,594	50,091	48,367	46,637	44,827	42,938	40,643	38,838	36,945	35,152	29,489	169
2007	396,074	353,776	294,036	256,705	230,644	200,109	157,994	134,008	115,594	100,086	87,232	78,206	71,398	65,531	60,990	56,802	53,868	51,291	49,204	47,346	45,265	43,515	41,827	40,102	38,275	36,327	34,581	32,834	31,111	27,595	173
2008	1,009,256	815,166	702,791	626,631	530,961	399,758	330,944	281,782	240,821	207,976	185,010	167,679	152,651	141,597	132,670	122,732	116,842	112,411	108,444	104,641	100,254	96,591	92,765	89,016	85,098	80,837	76,838	72,922	69,225	62,967	537
2009	1,729,309	1,587,216	1,458,989	1,240,662	951,624	817,654	684,792	568,259	478,825	419,853	375,889	331,399	303,969	284,338	267,257	250,093	241,404	234,051	227,264	220,349	211,996	204,884	197,875	191,019	183,862	175,635	168,422	161,169	154,055	141,436	887
2010	1,643,013	1,571,290	1,426,641	1,200,043	1,066,999	890,860	737,633	619,037	539,343	479,594	414,261	372,648	344,401	321,929	302,699	283,847	274,482	266,291	258,459	250,336	241,206	233,243	225,313	217,232	208,832	199,495	191,183	183,114	174,999	156,517	1,092
2011	1,190,540	1,104,925	949,276	847,021	710,222	590,847	498,010	435,253	387,070	333,745	301,751	280,557	263,027	249,248	236,678	222,575	216,482	210,981	205,643	199,920	193,554	188,237	182,545	176,899	171,036	164,406	158,491	152,797	146,978	129,340	915
2012	1,174,141	1,080,333	984,474	841,427	714,697	609,867	536,269	479,689	417,660	386,467	364,340	345,523	330,054	317,291	304,135	288,369	282,565	277,200	271,966	266,545	260,222	254,754	249,141	243,326	237,402	229,725	223,455	217,135	210,752	197,188	1,027
2013	1,331,754	1,266,508	1,115,433	971,350	844,623	746,624	669,625	586,382	554,804	532,790	512,690	496,033	482,036	469,769	457,072	442,775	435,589	428,931	422,386	415,625	402,994	395,968	388,629	380,975	372,938	358,842	349,892	341,707	333,937	305,559	1,182
2014	774,051	607,599	501,658	420,302	362,994	317,716	269,885	247,508	232,875	220,356	209,827	201,680	194,782	188,757	182,557	175,757	172,057	168,587	165,277	161,675	156,532	153,113	149,508	145,528	141,221	134,693	130,856	127,083	123,341	111,961	1,017
2015	1,081,798	932,963	794,082	687,015	597,846	488,122	445,587	417,750	394,967	376,935	361,967	349,476	338,117	328,038	318,335	308,328	301,806	295,784	289,812	283,535	275,300	269,241	262,751	255,810	248,739	238,786	232,029	225,039	218,039	203,166	1,805
2016	1,222,511	1,103,021	985,891	867,827	707,384	641,721	597,282	560,468	531,380	507,930	487,535	469,488	453,499	439,067	425,477	412,020	402,432	393,865	385,454	376,870	364,542	355,733	346,500	335,326	325,165	311,625	301,626	291,511	280,756	254,495	2,468
2017	1,224,461	1,123,620	1,001,730	800,804	727,199	673,191	625,336	587,593	558,013	533,216	509,932	488,850	470,272	453,560	438,457	423,853	413,109	403,173	393,605	383,451	369,483	359,441	348,412	336,477	325,406	311,598	300,287	288,381	274,662	241,681	2,024
2018	1,000,070	880,346	680,155	601,016	541,983	490,495	449,303	417,919	392,760	371,065	351,536	334,064	318,968	305,885	294,042	282,999	274,436	266,603	259,017	251,284	241,445	233,594	225,670	217,702	209,676	200,405	192,127	183,822	175,539	156,006	909
2019	949,126	713,490	624,596	558,610	502,822	455,899	419,435	390,307	365,786	344,570	324,999	307,577	292,922	280,286	268,908	258,411	250,038	242,449	235,060	227,699	218,990	211,605	204,262	196,830	189,182	180,864	173,083	165,343	157,617	144,561	1,836
2020	1,252,492	1,185,363	1,120,788	1,057,506	999,470	948,141	903,650	863,807	829,336	798,087	768,941	743,407	721,045	701,075	682,812	665,914	651,120	637,606	624,429	610,706	593,873	580,263	566,153	551,311	535,699	514,725	496,375	474,421	451,062	405,994	0

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Conditional Claim Rate
All Products Combined

Table 2: Number of Claims in Each Evaluation Year

	Evaluation Year																													
Fiscal Year	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	55	1,981	7,634	10,686	9,887	7,306	5,217	4,493	3,391	2,442	1,728	1,021	738	607	441	294	216	168	157	126	146	142	100	114	71	62	81	52	44	33
1991	42	1,593	6,098	7,633	6,675	5,196	4,705	3,733	2,657	1,921	1,102	784	563	439	303	203	126	139	114	131	136	120	116	73	84	104	58	42	39	16
1992	21	1,104	3,891	5,061	5,155	5,406	4,679	3,534	2,404	1,451	995	695	497	290	211	141	146	127	121	139	115	126	87	102	106	74	54	35	11	8
1993	40	1,456	5,019	7,266	9,290	8,394	6,510	4,442	2,525	1,758	1,314	876	529	337	242	203	207	243	245	190	239	173	212	221	162	90	64	29	30	34
1994	65	2,211	7,194	11,526	12,338	10,101	6,795	4,026	2,896	2,121	1,395	868	542	390	308	321	440	346	310	392	306	263	294	193	146	91	41	48	56	65
1995	36	1,216	5,525	8,839	8,282	5,818	3,711	2,580	2,322	1,528	873	560	394	324	324	357	314	248	277	210	235	260	181	135	91	35	31	36	40	38
1996	23	2,000	9,076	13,023	10,470	7,142	5,192	4,528	2,908	1,721	1,077	724	634	580	668	547	522	512	394	449	487	332	226	161	70	67	52	61	71	55
1997	37	2,325	9,105	11,128	8,621	7,078	5,976	3,840	2,369	1,452	982	847	724	820	687	608	669	518	531	570	408	276	192	97	90	97	94	72	78	68
1998	44	2,711	9,300	10,191	9,633	9,208	6,207	3,966	2,452	1,696	1,392	1,307	1,433	1,237	1,162	1,210	944	939	993	617	414	263	139	100	141	139	124	111	94	82
1999	45	2,937	9,879	13,609	15,407	10,914	6,766	3,983	2,662	2,196	2,000	2,131	2,006	1,743	1,845	1,337	1,309	1,321	870	657	384	202	170	178	223	177	158	140	105	85
2000	56	2,989	11,611	16,317	11,781	6,899	4,020	2,725	2,256	1,819	1,879	1,555	1,328	1,386	1,020	1,000	970	699	523	311	177	115	142	141	137	115	105	83	62	62
2001	18	3,500	14,759	16,551	11,509	7,098	4,720	3,849	3,272	3,539	3,108	2,617	2,663	1,915	1,858	1,704	1,168	731	500	256	174	210	212	177	150	142	117	112	82	70
2002	47	4,138	14,265	13,843	9,669	6,876	5,646	5,070	5,440	4,601	4,208	4,345	3,033	2,789	2,630	1,682	1,094	777	322	253	269	263	215	175	149	113	129	111	124	81
2003	44	4,751	10,542	9,280	7,421	6,949	6,662	7,887	6,629	6,601	7,104	5,058	4,012	3,492	2,183	1,357	838	378	354	332	312	294	202	203	167	170	149	141	135	102
2004	629	6,568	10,320	10,666	10,905	10,453	11,563	9,391	9,717	10,274	7,275	5,984	5,091	3,161	1,971	1,248	582	546	471	431	431	316	267	234	231	213	185	171	148	137
2005	238	3,186	7,538	9,242	10,021	10,830	8,956	8,930	9,504	6,818	5,583	4,651	3,011	1,830	1,197	510	472	400	335	332	221	203	182	164	168	143	129	126	118	82
2006	106	2,925	8,225	11,414	13,261	10,361	10,216	11,070	7,698	6,180	5,166	3,330	2,227	1,376	683	489	423	365	354	253	214	183	141	141	151	113	103	109	82	89
2007	105	3,628	11,302	15,622	11,700	12,909	16,327	10,385	7,729	6,611	4,432	2,749	1,866	956	576	603	495	452	331	261	217	200	165	182	155	156	118	133	113	85
2008	178	7,709	26,632	26,457	31,699	43,429	27,797	19,574	16,347	10,605	6,505	4,505	2,331	1,323	1,309	1,160	1,018	715	612	526	428	344	349	297	294	288	265	237	209	205
2009	310	9,271	20,765	30,939	47,607	35,606	26,233	21,696	14,524	9,255	6,079	3,198	1,853	1,828	1,598	1,465	976	836	631	569	448	391	321	267	280	265	266	240	212	172
2010	166	3,598	11,187	21,419	20,796	18,003	14,777	10,557	7,176	4,973	2,352	1,752	1,731	1,362	1,126	844	738	618	486	390	356	299	299	250	261	242	204	181	192	163
2011	118	2,317	6,993	8,225	8,118	7,373	5,873	3,990	2,767	1,335	1,202	1,227	1,009	824	667	490	424	363	287	261	223	196	179	149	188	132	133	135	119	111
2012	83	1,647	3,860	5,086	5,904	4,938	3,645	2,713	1,272	1,346	1,198	995	800	638	619	506	414	336	336	268	234	199	206	161	171	153	167	154	133	109
2013	97	1,472	3,799	5,565	5,811	4,618	3,514	1,808	1,981	2,168	1,818	1,640	1,356	1,286	1,204	1,088	902	806	678	625	529	408	395	394	351	331	299	266	295	234
2014	18	801	2,581	3,964	3,481	2,937	1,567	1,418	1,407	1,294	981	736	670	539	418	392	351	291	256	196	205	145	133	142	145	116	87	109	98	84
2015	18	728	3,086	4,107	4,192	2,550	2,366	2,669	2,183	1,719	1,127	874	761	645	556	481	419	341	330	257	232	203	151	156	158	146	108	126	113	104
2016	18	904	3,236	4,687	3,356	3,917	3,961	3,479	2,848	1,964	1,566	1,299	1,067	955	832	703	603	489	408	368	256	250	232	208	219	196	185	168	165	159
2017	25	933	3,584	3,682	5,674	7,567	6,733	5,193	3,650	2,815	2,175	1,820	1,554	1,176	1,088	866	716	626	549	493	381	350	308	307	281	305	265	202	224	186
2018	24	1,087	2,567	5,213	7,756	7,769	6,886	5,413	4,023	3,332	2,466	2,015	1,623	1,312	1,073	913	780	641	568	535	426	373	331	326	323	293	275	297	236	205
2019	30	503	4,038	6,632	7,394	7,007	5,569	4,131	3,346	2,801	2,240	1,825	1,419	1,134	1,003	844	714	621	541	446	430	342	300	302	249	238	227	217	223	204
2020	5	2,162	5,095	6,953	7,954	7,175	6,263	5,581	4,564	3,926	3,431	2,907	2,532	2,198	1,970	1,785	1,580	1,365	1,154	1,024	832	724	650	621	571	483	492	459	374	346

Table 3: Conditional Claim Rate = Table 2 / Table 1
Percentage of Active Loans at the Beginnng of the Evaluation Year that end in Claim During the Evaluation Year

	Evaluation Year																													
Fiscal Year	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	0.01%	0.28%	1.23%	2.50%	3.39%	2.82%	2.37%	2.34%	2.17%	1.99%	1.61%	1.11%	1.00%	1.07%	0.97%	0.80%	0.73%	0.62%	0.63%	0.54%	0.67%	0.70%	0.52%	0.63%	0.42%	0.39%	0.55%	0.38%	0.36%	0.35%
1991	0.01%	0.27%	1.36%	2.42%	2.35%	2.14%	2.22%	2.20%	2.02%	1.67%	1.14%	1.04%	1.01%	1.00%	0.84%	0.73%	0.50%	0.60%	0.53%	0.65%	0.73%	0.68%	0.70%	0.46%	0.57%	0.77%	0.46%	0.36%	0.38%	0.20%
1992	0.00%	0.20%	0.83%	1.17%	1.36%	1.61%	1.73%	1.70%	1.32%	0.96%	0.87%	0.90%	0.85%	0.62%	0.54%	0.45%	0.51%	0.48%	0.49%	0.60%	0.54%	0.63%	0.47%	0.59%	0.67%	0.51%	0.41%	0.30%	0.11%	0.09%
1993	0.00%	0.16%	0.60%	0.95%	1.35%	1.44%	1.38%	1.07%	0.73%	0.67%	0.79%	0.72%	0.55%	0.43%	0.36%	0.40%	0.44%	0.56%	0.61%	0.51%	0.71%	0.56%	0.74%	0.84%	0.68%	0.42%	0.34%	0.17%	0.19%	0.25%
1994	0.01%	0.21%	0.74%	1.31%	1.64%	1.63%	1.24%	0.87%	0.80%	0.89%	0.79%	0.63%	0.47%	0.40%	0.37%	0.48%	0.71%	0.60%	0.58%	0.81%	0.69%	0.64%	0.78%	0.56%	0.47%	0.33%	0.16%	0.21%	0.27%	0.38%
1995	0.01%	0.26%	1.33%	2.70%	3.23%	2.59%	2.03%	1.86%	2.49%	2.26%	1.67%	1.31%	1.08%	0.99%	1.09%	1.35%	1.27%	1.06%	1.27%	1.03%	1.24%	1.48%	1.12%	0.90%	0.66%	0.28%	0.27%	0.34%	0.42%	0.46%
1996	0.00%	0.28%	1.52%	2.79%	2.55%	2.14%	2.07%	2.77%	2.50%	1.94%	1.50%	1.18%	1.16%	1.15%	1.45%	1.33%	1.36%	1.44%	1.18%	1.45%	1.71%	1.26%	0.93%	0.71%	0.33%	0.35%	0.30%	0.38%	0.50%	0.45%
1997	0.00%	0.35%	1.77%	2.47%	2.44%	2.69%	3.48%	3.14%	2.55%	1.94%	1.54%	1.49%	1.38%	1.68%	1.51%	1.48%	1.75%	1.45%	1.59%	1.84%	1.44%	1.05%	0.79%	0.43%	0.43%	0.51%	0.54%	0.45%	0.54%	0.53%
1998	0.00%	0.30%	1.12%	1.45%	1.77%	2.78%	2.74%	2.37%	1.83%	1.49%	1.37%	1.41%	1.68%	1.57%	1.60%	1.91%	1.62%	1.74%	2.00%	1.36%	1.00%	0.68%	0.39%	0.31%	0.47%	0.52%	0.51%	0.51%	0.47%	0.46%
1999	0.00%	0.27%	1.07%	1.92%	3.52%	3.63%	3.07%	2.26%	1.77%	1.65%	1.65%	1.91%	1.95%	1.84%	2.18%	1.79%	1.91%	2.11%	1.51%	1.24%	0.79%	0.45%	0.41%	0.47%	0.64%	0.57%	0.56%	0.53%	0.44%	0.40%
2000	0.01%	0.49%	2.91%	6.80%	7.30%	5.96%	4.46%	3.64%	3.43%	3.04%	3.41%	3.02%	2.77%	3.15%	2.51%	2.70%	2.85%	2.23%	1.80%	1.15%	0.70%	0.49%	0.65%	0.70%	0.74%	0.68%	0.67%	0.57%	0.47%	0.54%
2001	0.00%	0.41%	3.02%	5.14%	5.02%	3.95%	3.13%	2.89%	2.76%	3.27%	3.13%	2.87%	3.26%	2.57%	2.74%	2.82%	2.13%	1.44%	1.06%	0.58%	0.43%	0.56%	0.61%	0.56%	0.51%	0.52%	0.46%	0.48%	0.38%	0.36%
2002	0.00%	0.56%	2.76%	3.67%	3.23%	2.73%	2.54%	2.57%	3.05%	2.82%	2.84%	3.35%	2.59%	2.63%	2.78%	2.06%	1.47%	1.13%	0.50%	0.43%	0.49%	0.52%	0.46%	0.39%	0.36%	0.29%	0.35%	0.33%	0.39%	0.29%
2003	0.00%	0.64%	1.83%	1.97%	1.82%	1.90%	2.02%	2.63%	2.42%	2.69%	3.42%	2.72%	2.42%	2.38%	1.69%	1.24%	0.83%	0.41%	0.41%	0.40%	0.41%	0.41%	0.30%	0.31%	0.27%	0.29%	0.27%	0.27%	0.27%	0.22%
2004	0.07%	0.95%	1.80%	2.17%	2.46%	2.62%	3.17%	2.81%	3.23%	4.04%	3.21%	2.95%	2.81%	1.96%	1.39%	1.00%	0.51%	0.51%	0.46%	0.45%	0.49%	0.38%	0.33%	0.30%	0.32%	0.31%	0.29%	0.28%	0.26%	0.31%
2005	0.05%	0.78%	2.08%	2.82%	3.38%	4.02%	3.62%	4.04%	5.15%	4.17%	3.84%	3.60%	2.62%	1.76%	1.27%	0.61%	0.60%	0.53%	0.46%	0.48%	0.34%	0.32%	0.30%	0.28%	0.30%	0.27%	0.25%	0.26%	0.25%	0.20%
2006	0.03%	0.81%	2.53%	4.08%	5.36%	4.66%	5.27%	7.10%	5.69%	5.24%	5.01%	3.65%	2.71%	1.83%	1.00%	0.78%	0.70%	0.64%	0.65%	0.48%	0.43%	0.38%	0.30%	0.31%	0.35%	0.28%	0.27%	0.30%	0.23%	0.30%
2007	0.03%	1.03%	3.84%	6.09%	5.07%	6.45%	10.33%	7.75%	6.69%	6.61%	5.08%	3.52%	2.61%	1.46%	0.94%	1.06%	0.92%	0.88%	0.67%	0.55%	0.48%	0.46%	0.39%	0.45%	0.40%	0.43%	0.34%	0.41%	0.36%	0.31%
2008	0.02%	0.95%	3.79%	4.22%	5.97%	10.86%	8.40%	6.95%	6.79%	5.10%	3.52%	2.69%	1.53%	0.93%	0.99%	0.95%	0.87%	0.64%	0.56%	0.50%	0.43%	0.36%	0.38%	0.33%	0.35%	0.36%	0.34%	0.33%	0.30%	0.33%
2009	0.02%	0.58%	1.42%	2.49%	5.00%	4.35%	3.83%	3.82%	3.03%	2.20%	1.62%	0.96%	0.61%	0.64%	0.60%	0.59%	0.40%	0.36%	0.28%	0.26%	0.21%	0.19%	0.16%	0.14%	0.15%	0.15%	0.16%	0.15%	0.14%	0.12%
2010	0.01%	0.23%	0.78%	1.78%	1.95%	2.02%	2.00%	1.71%	1.33%	1.04%	0.57%	0.47%	0.50%	0.42%	0.37%	0.30%	0.27%	0.23%	0.19%	0.16%	0.15%	0.13%	0.13%	0.12%	0.12%	0.12%	0.11%	0.10%	0.11%	0.10%
2011	0.01%	0.21%	0.74%	0.97%	1.14%	1.25%	1.18%	0.92%	0.71%	0.40%	0.40%	0.44%	0.38%	0.33%	0.28%	0.22%	0.20%	0.17%	0.14%	0.13%	0.12%	0.10%	0.10%	0.08%	0.11%	0.08%	0.08%	0.09%	0.08%	0.09%
2012	0.01%	0.15%	0.39%	0.60%	0.83%	0.81%	0.68%	0.57%	0.30%	0.35%	0.33%	0.29%	0.24%	0.20%	0.20%	0.18%	0.15%	0.12%	0.12%	0.10%	0.09%	0.08%	0.08%	0.07%	0.07%	0.07%	0.07%	0.07%	0.06%	0.06%
2013	0.01%	0.12%	0.34%	0.57%	0.69%	0.62%	0.52%	0.31%	0.36%	0.41%	0.35%	0.33%	0.28%	0.27%	0.26%	0.25%	0.21%	0.19%	0.16%	0.15%	0.13%	0.10%	0.10%	0.10%	0.09%	0.09%	0.09%	0.08%	0.09%	0.08%
2014	0.00%	0.13%	0.51%	0.94%	0.96%	0.92%	0.58%	0.57%	0.60%	0.59%	0.47%	0.36%	0.34%	0.29%	0.23%	0.22%	0.20%	0.17%	0.15%	0.12%	0.13%	0.09%	0.09%	0.10%	0.10%	0.09%	0.07%	0.09%	0.08%	0.08%
2015	0.00%	0.08%	0.39%	0.60%	0.70%	0.52%	0.53%	0.64%	0.55%	0.46%	0.31%	0.25%	0.23%	0.20%	0.17%	0.16%	0.14%	0.12%	0.11%	0.09%	0.08%	0.08%	0.06%	0.06%	0.06%	0.06%	0.05%	0.06%	0.05%	0.05%
2016	0.00%	0.08%	0.33%	0.54%	0.47%	0.61%	0.66%	0.62%	0.54%	0.39%	0.32%	0.28%	0.24%	0.22%	0.20%	0.17%	0.15%	0.12%	0.11%	0.10%	0.07%	0.07%	0.07%	0.06%	0.07%	0.06%	0.06%	0.06%	0.06%	0.06%
2017	0.00%	0.08%	0.36%	0.46%	0.78%	1.12%	1.08%	0.88%	0.65%	0.53%	0.43%	0.37%	0.33%	0.26%	0.25%	0.20%	0.17%	0.16%	0.14%	0.13%	0.10%	0.10%	0.09%	0.09%	0.09%	0.10%	0.09%	0.07%	0.08%	0.08%
2018	0.00%	0.12%	0.38%	0.87%	1.43%	1.58%	1.53%	1.30%	1.02%	0.90%	0.70%	0.60%	0.51%	0.43%	0.36%	0.32%	0.28%	0.24%	0.22%	0.21%	0.18%	0.16%	0.15%	0.15%	0.15%	0.15%	0.14%	0.16%	0.13%	0.13%
2019	0.00%	0.07%	0.65%	1.19%	1.47%	1.54%	1.33%	1.06%	0.91%	0.81%	0.69%	0.59%	0.48%	0.40%	0.37%	0.33%	0.29%	0.26%	0.23%	0.20%	0.20%	0.16%	0.15%	0.15%	0.13%	0.13%	0.13%	0.13%	0.14%	0.14%
2020	0.00%	0.18%	0.45%	0.66%	0.80%	0.76%	0.69%	0.65%	0.55%	0.49%	0.45%	0.39%	0.35%	0.31%	0.29%	0.27%	0.24%	0.21%	0.18%	0.17%	0.14%	0.12%	0.11%	0.11%	0.11%	0.09%	0.10%	0.10%	0.08%	0.09%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Cumulative Claim Rate
All Products Combined

Table 4: Cumulative Number of Claims as of Each Evaluation Year
Total Number of Claims for each Fiscal Year as of the End of the Evaluation Year

	Evaluation Year																													
Fiscal Year	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	55	2,036	9,670	20,356	30,243	37,549	42,766	47,259	50,650	53,092	54,820	55,841	56,579	57,186	57,627	57,921	58,137	58,305	58,462	58,588	58,734	58,876	58,976	59,090	59,161	59,223	59,304	59,356	59,400	59,433
1991	42	1,635	7,733	15,366	22,041	27,237	31,942	35,675	38,332	40,253	41,355	42,139	42,702	43,141	43,444	43,647	43,773	43,912	44,026	44,157	44,293	44,413	44,529	44,602	44,686	44,790	44,848	44,890	44,929	44,945
1992	21	1,125	5,016	10,077	15,232	20,638	25,317	28,851	31,255	32,706	33,701	34,396	34,893	35,183	35,394	35,535	35,681	35,808	35,929	36,068	36,183	36,309	36,396	36,498	36,604	36,678	36,732	36,767	36,778	36,786
1993	40	1,496	6,515	13,781	23,071	31,465	37,975	42,417	44,942	46,700	48,014	48,890	49,419	49,756	49,998	50,201	50,408	50,651	50,896	51,086	51,325	51,498	51,710	51,931	52,093	52,183	52,247	52,276	52,306	52,340
1994	65	2,276	9,470	20,996	33,334	43,435	50,230	54,256	57,152	59,273	60,668	61,536	62,078	62,468	62,776	63,097	63,537	63,883	64,193	64,585	64,891	65,154	65,448	65,641	65,787	65,878	65,919	65,967	66,023	66,088
1995	36	1,252	6,777	15,616	23,898	29,716	33,427	36,007	38,329	39,857	40,730	41,290	41,684	42,008	42,332	42,689	43,003	43,251	43,528	43,738	43,973	44,233	44,414	44,549	44,640	44,675	44,706	44,742	44,782	44,820
1996	23	2,023	11,099	24,122	34,592	41,734	46,926	51,454	54,362	56,083	57,160	57,884	58,518	59,098	59,766	60,313	60,835	61,347	61,741	62,190	62,677	63,009	63,235	63,396	63,466	63,533	63,585	63,646	63,717	63,772
1997	37	2,362	11,467	22,595	31,216	38,294	44,270	48,110	50,479	51,931	52,913	53,760	54,484	55,304	55,991	56,599	57,268	57,786	58,317	58,887	59,295	59,571	59,763	59,860	59,950	60,047	60,141	60,213	60,291	60,359
1998	44	2,755	12,055	22,246	31,879	41,087	47,294	51,260	53,712	55,408	56,800	58,107	59,540	60,777	61,939	63,149	64,093	65,032	66,025	66,642	67,056	67,319	67,458	67,558	67,699	67,838	67,962	68,073	68,167	68,249
1999	45	2,982	12,861	26,470	41,877	52,791	59,557	63,540	66,202	68,398	70,398	72,529	74,535	76,278	78,123	79,460	80,769	82,090	82,960	83,617	84,001	84,203	84,373	84,551	84,774	84,951	85,109	85,249	85,354	85,439
2000	56	3,045	14,656	30,973	42,754	49,653	53,673	56,398	58,654	60,473	62,352	63,907	65,235	66,621	67,641	68,641	69,611	70,310	70,833	71,144	71,321	71,436	71,578	71,719	71,856	71,971	72,076	72,159	72,221	72,283
2001	18	3,518	18,277	34,828	46,337	53,435	58,155	62,004	65,276	68,815	71,923	74,540	77,203	79,118	80,976	82,680	83,848	84,579	85,079	85,335	85,509	85,719	85,931	86,108	86,258	86,400	86,517	86,629	86,711	86,781
2002	47	4,185	18,450	32,293	41,962	48,838	54,484	59,554	64,994	69,595	73,803	78,148	81,181	83,970	86,600	88,282	89,376	90,153	90,475	90,728	90,997	91,260	91,475	91,650	91,799	91,912	92,041	92,152	92,276	92,357
2003	44	4,795	15,337	24,617	32,038	38,987	45,649	53,536	60,165	66,766	73,870	78,928	82,940	86,432	88,615	89,972	90,810	91,188	91,542	91,874	92,186	92,480	92,682	92,885	93,052	93,222	93,371	93,512	93,647	93,749
2004	629	7,197	17,517	28,183	39,088	49,541	61,104	70,495	80,212	90,486	97,761	103,745	108,836	111,997	113,968	115,216	115,798	116,344	116,815	117,246	117,677	117,993	118,260	118,494	118,725	118,938	119,123	119,294	119,442	119,579
2005	238	3,424	10,962	20,204	30,225	41,055	50,011	58,941	68,445	75,263	80,846	85,497	88,508	90,338	91,535	92,045	92,517	92,917	93,252	93,584	93,805	94,008	94,190	94,354	94,522	94,665	94,794	94,920	95,038	95,120
2006	106	3,031	11,256	22,670	35,931	46,292	56,508	67,578	75,276	81,456	86,622	89,952	92,179	93,555	94,238	94,727	95,150	95,515	95,869	96,122	96,336	96,519	96,660	96,801	96,952	97,065	97,168	97,277	97,359	97,448
2007	105	3,733	15,035	30,657	42,357	55,266	71,593	81,978	89,707	96,318	100,750	103,499	105,365	106,321	106,897	107,500	107,995	108,447	108,778	109,039	109,256	109,456	109,621	109,803	109,958	110,114	110,232	110,365	110,478	110,563
2008	178	7,887	34,519	60,976	92,675	136,104	163,901	183,475	199,822	210,427	216,932	221,437	223,768	225,091	226,400	227,560	228,578	229,293	229,905	230,431	230,859	231,203	231,552	231,849	232,143	232,431	232,696	232,933	233,142	233,347
2009	310	9,581	30,346	61,285	108,892	144,498	170,731	192,427	206,951	216,206	222,285	225,483	227,336	229,164	230,762	232,227	233,203	234,039	234,670	235,239	235,687	236,078	236,399	236,666	236,946	237,211	237,477	237,717	237,929	238,101
2010	166	3,764	14,951	36,370	57,166	75,169	89,946	100,503	107,679	112,652	115,004	116,756	118,487	119,849	120,975	121,819	122,557	123,175	123,661	124,051	124,407	124,706	125,005	125,255	125,516	125,758	125,962	126,143	126,335	126,498
2011	118	2,435	9,428	17,653	25,771	33,144	39,017	43,007	45,774	47,109	48,311	49,538	50,547	51,371	52,038	52,528	52,952	53,315	53,602	53,863	54,086	54,282	54,461	54,610	54,798	54,930	55,063	55,198	55,317	55,428
2012	83	1,730	5,590	10,676	16,580	21,518	25,163	27,876	29,148	30,494	31,692	32,687	33,487	34,125	34,744	35,250	35,664	36,000	36,336	36,604	36,838	37,037	37,243	37,404	37,575	37,728	37,895	38,049	38,182	38,291
2013	97	1,569	5,368	10,933	16,744	21,362	24,876	26,684	28,665	30,833	32,651	34,291	35,647	36,933	38,137	39,225	40,127	40,933	41,611	42,236	42,765	43,173	43,568	43,962	44,313	44,644	44,943	45,209	45,504	45,738
2014	18	819	3,400	7,364	10,845	13,782	15,349	16,767	18,174	19,468	20,449	21,185	21,855	22,394	22,812	23,204	23,555	23,846	24,102	24,298	24,503	24,648	24,781	24,923	25,068	25,184	25,271	25,380	25,478	25,562
2015	18	746	3,832	7,939	12,131	14,681	17,047	19,716	21,899	23,618	24,745	25,619	26,380	27,025	27,581	28,062	28,481	28,822	29,152	29,409	29,641	29,844	29,995	30,151	30,309	30,455	30,563	30,689	30,802	30,906
2016	18	922	4,158	8,845	12,201	16,118	20,079	23,558	26,406	28,370	29,936	31,235	32,302	33,257	34,089	34,792	35,395	35,884	36,292	36,660	36,916	37,166	37,398	37,606	37,825	38,021	38,206	38,374	38,539	38,698
2017	25	958	4,542	8,224	13,898	21,465	28,198	33,391	37,041	39,856	42,031	43,851	45,405	46,581	47,669	48,535	49,251	49,877	50,426	50,919	51,300	51,650	51,958	52,265	52,546	52,851	53,116	53,318	53,542	53,728
2018	24	1,111	3,678	8,891	16,647	24,416	31,302	36,715	40,738	44,070	46,536	48,551	50,174	51,486	52,559	53,472	54,252	54,893	55,461	55,996	56,422	56,795	57,126	57,452	57,775	58,068	58,343	58,640	58,876	59,081
2019	30	533	4,571	11,203	18,597	25,604	31,173	35,304	38,650	41,451	43,691	45,516	46,935	48,069	49,072	49,916	50,630	51,251	51,792	52,238	52,668	53,010	53,310	53,612	53,861	54,099	54,326	54,543	54,766	54,970
2020	5	2,167	7,262	14,215	22,169	29,344	35,607	41,188	45,752	49,678	53,109	56,016	58,548	60,746	62,716	64,501	66,081	67,446	68,600	69,624	70,456	71,180	71,830	72,451	73,022	73,505	73,997	74,456	74,830	75,176

Table 5: Cumulative Claim Rate = Table 4 / Table 1 (Evaluation Year 1)
Cumulative Claims as of Evaluation Year Divided by Active Loans as of Evaluation Year 1

	Evaluation Year																													
Fiscal Year	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	0.01%	0.28%	1.35%	2.84%	4.22%	5.24%	5.97%	6.60%	7.07%	7.41%	7.65%	7.80%	7.90%	7.98%	8.05%	8.09%	8.12%	8.14%	8.16%	8.18%	8.20%	8.22%	8.23%	8.25%	8.26%	8.27%	8.28%	8.29%	8.29%	8.30%
1991	0.01%	0.26%	1.25%	2.48%	3.55%	4.39%	5.15%	5.75%	6.18%	6.49%	6.67%	6.79%	6.88%	6.95%	7.00%	7.04%	7.06%	7.08%	7.10%	7.12%	7.14%	7.16%	7.18%	7.19%	7.20%	7.22%	7.23%	7.24%	7.24%	7.24%
1992	0.00%	0.18%	0.82%	1.65%	2.50%	3.39%	4.16%	4.74%	5.13%	5.37%	5.53%	5.65%	5.73%	5.78%	5.81%	5.84%	5.86%	5.88%	5.90%	5.92%	5.94%	5.96%	5.98%	5.99%	6.01%	6.02%	6.03%	6.04%	6.04%	6.04%
1993	0.00%	0.16%	0.68%	1.45%	2.42%	3.30%	3.98%	4.45%	4.72%	4.90%	5.04%	5.13%	5.19%	5.22%	5.25%	5.27%	5.29%	5.32%	5.34%	5.36%	5.39%	5.40%	5.43%	5.45%	5.47%	5.48%	5.48%	5.49%	5.49%	5.49%
1994	0.01%	0.21%	0.86%	1.92%	3.04%	3.96%	4.58%	4.95%	5.21%	5.41%	5.53%	5.61%	5.66%	5.70%	5.73%	5.76%	5.80%	5.83%	5.86%	5.89%	5.92%	5.94%	5.97%	5.99%	6.00%	6.01%	6.01%	6.02%	6.02%	6.03%
1995	0.01%	0.25%	1.36%	3.13%	4.78%	5.95%	6.69%	7.21%	7.67%	7.98%	8.15%	8.26%	8.34%	8.41%	8.47%	8.54%	8.61%	8.66%	8.71%	8.75%	8.80%	8.85%	8.89%	8.92%	8.94%	8.94%	8.95%	8.96%	8.96%	8.97%
1996	0.00%	0.27%	1.47%	3.19%	4.57%	5.52%	6.20%	6.80%	7.18%	7.41%	7.55%	7.65%	7.73%	7.81%	7.90%	7.97%	8.04%	8.11%	8.16%	8.22%	8.28%	8.33%	8.36%	8.38%	8.39%	8.40%	8.40%	8.41%	8.42%	8.43%
1997	0.00%	0.32%	1.54%	3.02%	4.18%	5.13%	5.93%	6.44%	6.76%	6.95%	7.08%	7.20%	7.29%	7.40%	7.50%	7.58%	7.67%	7.74%	7.81%	7.88%	7.94%	7.97%	8.00%	8.01%	8.03%	8.04%	8.05%	8.06%	8.07%	8.08%
1998	0.00%	0.28%	1.23%	2.26%	3.24%	4.18%	4.81%	5.22%	5.47%	5.64%	5.78%	5.91%	6.06%	6.18%	6.30%	6.43%	6.52%	6.62%	6.72%	6.78%	6.82%	6.85%	6.86%	6.87%	6.89%	6.90%	6.92%	6.93%	6.94%	6.94%
1999	0.00%	0.27%	1.15%	2.36%	3.73%	4.70%	5.31%	5.66%	5.90%	6.09%	6.27%	6.46%	6.64%	6.80%	6.96%	7.08%	7.20%	7.31%	7.39%	7.45%	7.48%	7.50%	7.52%	7.53%	7.55%	7.57%	7.58%	7.60%	7.60%	7.61%
2000	0.01%	0.38%	1.83%	3.86%	5.33%	6.19%	6.69%	7.03%	7.31%	7.54%	7.77%	7.97%	8.13%	8.31%	8.43%	8.56%	8.68%	8.77%	8.83%	8.87%	8.89%	8.91%	8.93%	8.94%	8.96%	8.97%	8.99%	9.00%	9.01%	9.01%
2001	0.00%	0.34%	1.76%	3.36%	4.47%	5.16%	5.61%	5.99%	6.30%	6.64%	6.94%	7.20%	7.45%	7.64%	7.82%	7.98%	8.10%	8.17%	8.21%	8.24%	8.26%	8.28%	8.30%	8.31%	8.33%	8.34%	8.35%	8.36%	8.37%	8.38%
2002	0.00%	0.39%	1.70%	2.98%	3.88%	4.51%	5.03%	5.50%	6.00%	6.43%	6.82%	7.22%	7.50%	7.76%	8.00%	8.15%	8.26%	8.33%	8.36%	8.38%	8.41%	8.43%	8.45%	8.47%	8.48%	8.49%	8.50%	8.51%	8.52%	8.53%
2003	0.00%	0.53%	1.71%	2.74%	3.57%	4.35%	5.09%	5.97%	6.71%	7.44%	8.24%	8.80%	9.25%	9.64%	9.88%	10.03%	10.12%	10.17%	10.21%	10.24%	10.28%	10.31%	10.33%	10.36%	10.37%	10.39%	10.41%	10.43%	10.44%	10.45%
2004	0.07%	0.85%	2.07%	3.33%	4.62%	5.86%	7.22%	8.33%	9.48%	10.70%	11.56%	12.26%	12.87%	13.24%	13.47%	13.62%	13.69%	13.75%	13.81%	13.86%	13.91%	13.95%	13.98%	14.01%	14.03%	14.06%	14.08%	14.10%	14.12%	14.14%
2005	0.05%	0.75%	2.39%	4.41%	6.60%	8.97%	10.92%	12.87%	14.95%	16.44%	17.66%	18.67%	19.33%	19.73%	19.99%	20.10%	20.21%	20.29%	20.37%	20.44%	20.49%	20.53%	20.57%	20.61%	20.64%	20.67%	20.70%	20.73%	20.76%	20.77%
2006	0.03%	0.77%	2.86%	5.76%	9.13%	11.77%	14.36%	17.18%	19.13%	20.70%	22.02%	22.86%	23.43%	23.78%	23.95%	24.08%	24.18%	24.28%	24.37%	24.43%	24.49%	24.53%	24.57%	24.60%	24.64%	24.67%	24.70%	24.72%	24.75%	24.77%
2007	0.03%	0.94%	3.80%	7.74%	10.69%	13.95%	18.08%	20.70%	22.65%	24.32%	25.44%	26.13%	26.60%	26.84%	26.99%	27.14%	27.27%	27.38%	27.46%	27.53%	27.58%	27.64%	27.68%	27.72%	27.76%	27.80%	27.83%	27.86%	27.89%	27.91%
2008	0.02%	0.78%	3.42%	6.04%	9.18%	13.49%	16.24%	18.18%	19.80%	20.85%	21.49%	21.94%	22.17%	22.30%	22.43%	22.55%	22.65%	22.72%	22.78%	22.83%	22.87%	22.91%	22.94%	22.97%	23.00%	23.03%	23.06%	23.08%	23.10%	23.12%
2009	0.02%	0.55%	1.75%	3.54%	6.30%	8.36%	9.87%	11.13%	11.97%	12.50%	12.85%	13.04%	13.15%	13.25%	13.34%	13.43%	13.49%	13.53%	13.57%	13.60%	13.63%	13.65%	13.67%	13.69%	13.70%	13.72%	13.73%	13.75%	13.76%	13.77%
2010	0.01%	0.23%	0.91%	2.21%	3.48%	4.58%	5.47%	6.12%	6.55%	6.86%	7.00%	7.11%	7.21%	7.29%	7.36%	7.41%	7.46%	7.50%	7.53%	7.55%	7.57%	7.59%	7.61%	7.62%	7.64%	7.65%	7.67%	7.68%	7.69%	7.70%
2011	0.01%	0.20%	0.79%	1.48%	2.16%	2.78%	3.28%	3.61%	3.84%	3.96%	4.06%	4.16%	4.25%	4.31%	4.37%	4.41%	4.45%	4.48%	4.50%	4.52%	4.54%	4.56%	4.57%	4.59%	4.60%	4.61%	4.63%	4.64%	4.65%	4.66%
2012	0.01%	0.15%	0.48%	0.91%	1.41%	1.83%	2.14%	2.37%	2.48%	2.60%	2.70%	2.78%	2.85%	2.91%	2.96%	3.00%	3.04%	3.07%	3.09%	3.12%	3.14%	3.15%	3.17%	3.19%	3.20%	3.21%	3.23%	3.24%	3.25%	3.26%
2013	0.01%	0.12%	0.40%	0.82%	1.26%	1.60%	1.87%	2.00%	2.15%	2.32%	2.45%	2.57%	2.68%	2.77%	2.86%	2.95%	3.01%	3.07%	3.12%	3.17%	3.21%	3.24%	3.27%	3.30%	3.33%	3.35%	3.37%	3.39%	3.42%	3.43%
2014	0.00%	0.11%	0.44%	0.95%	1.40%	1.78%	1.98%	2.17%	2.35%	2.52%	2.64%	2.74%	2.82%	2.89%	2.95%	3.00%	3.04%	3.08%	3.11%	3.14%	3.17%	3.18%	3.20%	3.22%	3.24%	3.25%	3.26%	3.28%	3.29%	3.30%
2015	0.00%	0.07%	0.35%	0.73%	1.12%	1.36%	1.58%	1.82%	2.02%	2.18%	2.29%	2.37%	2.44%	2.50%	2.55%	2.59%	2.63%	2.66%	2.69%	2.72%	2.74%	2.76%	2.77%	2.79%	2.80%	2.82%	2.83%	2.84%	2.85%	2.86%
2016	0.00%	0.08%	0.34%	0.72%	1.00%	1.32%	1.64%	1.93%	2.16%	2.32%	2.45%	2.55%	2.64%	2.72%	2.79%	2.85%	2.90%	2.94%	2.97%	3.00%	3.02%	3.04%	3.06%	3.08%	3.09%	3.11%	3.13%	3.14%	3.15%	3.17%
2017	0.00%	0.08%	0.37%	0.67%	1.14%	1.75%	2.30%	2.73%	3.03%	3.25%	3.43%	3.58%	3.71%	3.80%	3.89%	3.96%	4.02%	4.07%	4.12%	4.16%	4.19%	4.22%	4.24%	4.27%	4.29%	4.32%	4.34%	4.35%	4.37%	4.39%
2018	0.00%	0.11%	0.37%	0.89%	1.66%	2.44%	3.13%	3.67%	4.07%	4.41%	4.65%	4.85%	5.02%	5.15%	5.26%	5.35%	5.42%	5.49%	5.55%	5.60%	5.64%	5.68%	5.71%	5.74%	5.78%	5.81%	5.83%	5.86%	5.89%	5.91%
2019	0.00%	0.06%	0.48%	1.18%	1.96%	2.70%	3.28%	3.72%	4.07%	4.37%	4.60%	4.80%	4.95%	5.06%	5.17%	5.26%	5.33%	5.40%	5.46%	5.50%	5.55%	5.59%	5.62%	5.65%	5.67%	5.70%	5.72%	5.75%	5.77%	5.79%
2020	0.00%	0.17%	0.58%	1.13%	1.77%	2.34%	2.84%	3.29%	3.65%	3.97%	4.24%	4.47%	4.67%	4.85%	5.01%	5.15%	5.28%	5.38%	5.48%	5.56%	5.63%	5.68%	5.73%	5.78%	5.83%	5.87%	5.91%	5.94%	5.97%	6.00%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Conditional Non-Claim Termination Rate
All Products Combined

Table 6: Number of Non-Claim Terminations in Each Evaluation Year

	Evaluation Year																												
Fiscal Year	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	2,405	14,565	69,434	184,790	125,943	25,228	33,727	23,399	32,677	30,726	13,481	14,506	17,473	16,339	10,757	6,566	6,803	2,583	1,747	1,581	1,111	1,180	953	962	1,065	998	963	1,011	1,340	1,945
1991	1,803	29,252	135,935	124,045	24,905	36,357	26,107	38,539	35,239	14,667	17,229	20,336	19,117	11,722	7,170	6,535	2,687	1,781	1,598	1,021	1,121	898	879	894	905	875	901	1,004	1,138	1,662
1992	3,505	49,474	85,399	31,094	48,465	38,116	61,086	58,448	23,395	30,070	35,848	35,527	18,803	10,976	7,880	4,942	2,783	1,961	1,596	1,393	1,258	1,307	1,257	1,213	1,285	1,254	1,289	1,382	1,522	882
1993	13,016	61,639	43,301	71,924	63,832	98,562	105,528	50,404	65,996	81,108	95,529	44,575	25,232	16,955	11,384	7,750	3,928	3,290	2,767	2,609	2,668	2,312	2,276	2,159	2,188	2,109	2,059	2,107	1,366	1,150
1994	10,915	35,074	81,417	75,491	119,827	122,389	62,490	82,935	98,281	120,536	60,985	35,753	23,473	15,755	12,593	6,839	4,321	3,845	3,662	3,913	3,225	2,974	3,072	3,015	3,022	2,702	2,589	1,892	1,671	1,544
1995	6,875	38,441	38,913	78,770	63,158	26,165	37,542	41,714	43,370	23,976	14,478	9,049	5,764	3,387	2,195	1,770	1,216	1,182	1,272	1,083	1,153	1,111	1,142	1,080	1,075	1,043	945	924	961	852
1996	3,846	28,377	121,828	115,653	45,599	70,057	77,302	83,181	43,934	25,853	15,722	9,764	5,945	4,034	3,416	2,664	1,986	2,217	1,953	1,859	1,836	1,815	1,711	1,652	1,618	1,626	1,480	1,620	1,486	1,272
1997	5,216	83,963	137,296	53,505	87,876	82,741	85,642	45,582	27,145	16,470	10,071	6,005	3,688	2,779	2,501	2,299	2,178	1,902	1,884	1,883	2,016	1,803	1,684	1,583	1,725	1,540	1,641	1,479	1,298	1,080
1998	14,110	80,486	60,504	115,654	150,863	203,103	98,414	55,262	30,615	18,274	11,064	7,940	5,848	5,078	5,045	5,764	3,676	3,512	3,468	3,536	3,130	2,726	2,697	2,931	2,635	2,793	2,404	2,096	1,780	1,607
1999	8,417	35,867	147,135	202,787	256,670	126,652	73,413	40,049	23,684	14,354	10,164	7,413	6,564	6,433	8,082	5,595	4,587	4,446	4,418	3,922	3,534	3,346	3,371	3,067	3,316	3,091	2,543	2,078	2,009	1,864
2000	5,054	194,810	193,182	142,957	66,938	38,769	21,615	12,555	6,791	4,132	2,784	2,083	2,157	2,616	2,231	2,104	2,011	1,881	1,808	1,598	1,552	1,611	1,484	1,631	1,562	1,323	1,145	1,119	1,104	1,004
2001	32,499	177,376	351,154	150,073	81,599	42,427	23,923	14,158	11,010	7,101	5,499	5,516	7,078	5,097	4,764	4,680	3,995	3,485	3,006	2,911	2,912	2,612	2,698	2,569	2,242	1,838	1,831	1,767	1,663	1,601
2002	35,873	343,679	203,064	126,780	67,695	40,632	23,957	20,080	13,309	10,575	10,739	14,108	9,317	8,591	8,479	8,092	5,649	4,917	4,596	4,236	3,582	3,558	3,314	2,690	2,460	2,358	2,240	2,245	2,264	2,025
2003	61,065	147,924	159,115	93,710	57,509	33,951	29,420	21,797	18,996	21,966	30,680	16,964	15,842	15,305	15,708	12,057	8,161	8,100	5,385	4,065	3,984	3,529	3,076	2,761	2,771	2,739	2,679	2,668	2,567	2,386
2004	45,769	149,872	106,811	69,183	38,657	32,855	23,899	20,240	24,290	36,036	19,665	17,695	16,908	16,878	15,284	10,739	9,529	6,709	5,201	5,089	4,412	3,740	3,326	3,254	3,327	3,279	3,236	3,111	2,926	2,710
2005	20,203	44,351	40,241	25,806	21,370	15,669	13,288	17,389	27,105	13,921	12,467	11,540	10,954	9,200	8,336	7,569	4,108	2,843	2,790	2,519	2,121	1,925	1,820	1,935	1,982	1,975	1,925	1,969	1,945	1,754
2006	6,313	27,254	29,456	34,402	19,316	14,428	18,385	26,729	13,064	11,167	9,422	8,648	6,818	5,656	5,708	3,837	2,449	2,387	2,171	1,858	1,607	1,532	1,577	1,660	1,647	1,686	1,663	1,702	1,665	1,564
2007	6,148	38,670	48,438	21,709	14,360	17,626	25,788	13,601	10,685	8,894	8,393	6,277	4,941	4,910	3,893	2,866	2,436	2,125	1,756	1,581	1,539	1,543	1,516	1,537	1,652	1,623	1,614	1,603	1,578	1,531
2008	22,137	186,381	85,743	49,703	63,971	87,774	41,017	29,588	24,614	22,236	16,398	12,825	12,696	9,730	7,523	6,532	4,849	3,716	3,355	3,244	3,310	3,314	3,468	3,445	3,604	3,641	3,718	3,665	3,469	3,269
2009	101,679	132,822	107,462	187,388	241,431	98,364	106,629	94,836	74,910	49,698	37,777	41,290	25,567	17,798	15,192	11,222	7,670	6,515	6,153	6,273	6,369	6,706	6,671	6,571	6,830	6,786	6,907	6,969	6,801	6,349
2010	23,715	68,125	133,462	205,179	112,248	158,135	138,450	108,038	72,518	54,756	62,832	39,857	26,509	21,102	17,556	12,113	8,600	7,571	7,344	7,588	7,639	7,639	7,612	7,811	8,036	8,042	8,082	7,863	7,814	7,190
2011	6,004	83,298	148,656	94,030	128,681	112,002	86,964	58,767	45,416	51,973	30,585	19,964	16,520	12,951	11,604	8,175	5,626	5,138	5,050	5,364	5,294	5,111	5,510	5,488	5,590	5,712	5,753	5,530	5,584	5,231
2012	10,273	92,161	91,999	137,961	120,826	99,892	69,953	53,867	60,756	29,840	20,682	17,817	14,658	12,118	12,225	8,611	5,369	5,029	4,897	5,104	5,064	5,237	5,367	5,578	5,662	5,896	5,984	6,055	6,133	5,959
2013	12,986	63,774	147,276	138,518	120,916	93,381	73,485	81,435	29,597	19,829	17,996	14,995	12,625	10,949	11,123	8,191	6,225	5,841	5,852	5,823	6,090	6,202	6,441	6,699	6,797	7,118	7,358	7,422	7,217	6,899
2014	12,278	165,651	103,360	77,392	53,826	42,341	46,264	20,959	13,226	11,214	9,420	7,395	6,212	5,466	5,585	4,321	3,326	3,167	3,044	3,135	3,169	3,144	3,284	3,276	3,520	3,491	3,636	3,607	3,560	3,435
2015	34,404	148,107	135,795	102,960	84,977	107,174	40,169	25,168	20,598	16,300	13,757	11,610	10,587	9,415	9,040	7,640	6,063	5,671	5,624	5,762	5,773	5,695	6,082	6,111	6,058	6,584	6,407	6,664	6,662	6,458
2016	35,508	118,586	113,894	113,377	157,087	61,746	40,478	33,335	26,238	21,480	18,745	16,739	14,912	13,467	12,642	10,690	8,951	8,071	7,989	8,004	8,266	8,360	8,538	8,964	9,020	9,316	9,412	9,490	9,306	9,014
2017	21,939	99,908	118,306	197,244	67,931	46,441	41,122	32,549	25,929	21,976	21,001	19,250	17,011	15,515	13,863	11,801	10,003	9,307	8,998	9,172	9,210	9,235	9,538	9,683	10,000	9,963	10,366	10,280	10,091	9,434
2018	14,502	118,637	197,624	73,926	51,277	43,719	34,306	25,971	21,136	18,357	17,015	15,450	13,464	11,763	10,669	9,042	7,761	7,192	6,972	6,833	6,937	7,099	7,132	7,270	7,441	7,591	7,690	7,500	7,419	7,044
2019	41,267	235,133	84,856	59,354	48,394	39,916	30,895	24,996	21,174	18,407	17,266	15,592	13,228	11,493	10,308	8,971	7,647	6,968	6,837	6,796	6,906	6,943	6,988	7,083	7,326	7,182	7,444	7,392	7,102	6,952
2020	52,782	64,967	59,480	56,329	50,082	44,154	38,227	34,262	29,906	27,319	25,659	22,624	19,821	17,753	16,231	14,483	13,213	12,148	12,005	12,342	12,361	12,612	13,028	13,554	13,841	13,900	14,378	14,429	14,052	13,394

Table 7: Non-Claim Termination Rate = Table 6 / Table 1
Percentage of Active Loans at the Beginnng of the Evaluation Year that end in Termination by Other Than Claim During the Evaluation Year

	Evaluation Year																												
Fiscal Year	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	0.34%	2.08%	11.15%	43.26%	43.22%	9.75%	15.34%	12.19%	20.96%	25.03%	12.54%	15.77%	23.68%	28.75%	23.65%	17.83%	22.93%	9.60%	6.99%	6.80%	5.11%	5.79%	4.93%	5.28%	6.25%	6.34%	6.56%	7.43%	11.07%	20.39%
1991	0.29%	4.96%	30.38%	39.28%	8.76%	14.98%	12.32%	22.72%	26.76%	12.74%	17.81%	26.89%	34.16%	26.77%	19.80%	23.41%	10.75%	7.72%	7.49%	5.06%	5.99%	5.08%	5.27%	5.69%	6.16%	6.44%	7.14%	8.69%	11.02%	20.26%
1992	0.58%	8.86%	18.21%	7.18%	12.78%	11.35%	22.62%	28.10%	12.84%	19.96%	31.50%	45.79%	32.26%	23.35%	20.28%	15.65%	9.79%	7.45%	6.49%	6.04%	5.87%	6.54%	6.75%	7.00%	8.08%	8.67%	9.84%	11.84%	15.04%	9.90%
1993	1.37%	6.93%	5.15%	9.43%	9.26%	16.93%	22.44%	12.13%	19.03%	30.72%	57.20%	36.68%	26.35%	21.61%	17.12%	15.09%	8.43%	7.64%	6.92%	7.02%	7.95%	7.44%	7.97%	8.25%	9.21%	9.94%	10.82%	12.48%	8.85%	8.61%
1994	1.00%	3.31%	8.39%	8.55%	15.96%	19.79%	11.38%	17.94%	27.22%	50.59%	34.75%	25.75%	20.46%	15.99%	15.09%	10.27%	7.01%	6.71%	6.87%	8.04%	7.30%	7.27%	8.19%	8.80%	9.76%	9.78%	10.38%	8.25%	7.93%	8.95%
1995	1.38%	8.36%	9.37%	24.02%	24.63%	11.66%	20.49%	30.03%	46.53%	35.42%	27.70%	21.22%	15.80%	10.35%	7.37%	6.71%	4.92%	5.08%	5.85%	5.31%	6.10%	6.34%	7.05%	7.21%	7.80%	8.25%	8.11%	8.64%	9.99%	10.38%
1996	0.51%	3.91%	20.46%	24.78%	11.10%	21.01%	30.81%	50.96%	37.75%	29.11%	21.85%	15.89%	10.84%	8.03%	7.42%	6.50%	5.18%	6.22%	5.87%	6.00%	6.44%	6.89%	7.01%	7.31%	7.74%	8.51%	8.42%	10.20%	10.40%	10.30%
1997	0.70%	12.71%	26.70%	11.90%	24.88%	31.42%	49.87%	37.27%	29.26%	22.00%	15.81%	10.57%	7.04%	5.70%	5.50%	5.58%	5.70%	5.31%	5.64%	6.09%	7.11%	6.86%	6.91%	6.97%	8.26%	8.03%	9.42%	9.32%	8.97%	8.44%
1998	1.44%	8.95%	7.29%	16.43%	27.76%	61.34%	43.45%	33.04%	22.82%	16.00%	10.88%	8.59%	6.87%	6.44%	6.96%	9.10%	6.29%	6.50%	7.00%	7.79%	7.54%	7.08%	7.57%	8.99%	8.83%	10.45%	9.96%	9.56%	8.93%	9.06%
1999	0.75%	3.31%	15.88%	28.55%	58.59%	42.14%	33.32%	22.71%	15.79%	10.76%	8.39%	6.65%	6.37%	6.79%	9.54%	7.51%	6.70%	7.09%	7.69%	7.43%	7.27%	7.43%	8.12%	8.02%	9.55%	9.91%	8.94%	7.93%	8.37%	8.85%
2000	0.63%	32.24%	48.37%	59.54%	41.47%	33.50%	23.99%	16.78%	10.33%	6.91%	5.05%	4.05%	4.49%	5.95%	5.49%	5.69%	5.92%	5.99%	6.22%	5.89%	6.14%	6.85%	6.78%	8.11%	8.48%	7.81%	7.30%	7.73%	8.30%	8.68%
2001	3.14%	20.75%	71.82%	46.56%	35.60%	23.61%	15.84%	10.64%	9.27%	6.57%	5.53%	6.04%	8.68%	6.84%	7.02%	7.76%	7.27%	6.87%	6.37%	6.61%	7.19%	6.96%	7.79%	8.06%	7.60%	6.72%	7.21%	7.52%	7.66%	8.17%
2002	3.31%	46.77%	39.24%	33.65%	22.61%	16.13%	10.78%	10.18%	7.46%	6.48%	7.25%	10.88%	7.94%	8.11%	8.95%	9.89%	7.57%	7.13%	7.18%	7.12%	6.54%	7.02%	7.02%	6.07%	5.90%	6.06%	6.15%	6.59%	7.17%	7.18%
2003	6.81%	19.88%	27.69%	19.87%	14.14%	9.28%	8.92%	7.27%	6.92%	8.94%	14.77%	9.14%	9.56%	10.42%	12.19%	10.99%	8.10%	8.78%	6.23%	4.96%	5.29%	4.94%	4.51%	4.23%	4.45%	4.73%	4.86%	5.11%	5.22%	5.24%
2004	5.41%	21.74%	18.66%	14.05%	8.73%	8.22%	6.56%	6.05%	8.08%	14.18%	8.67%	8.71%	9.34%	10.48%	10.79%	8.58%	8.29%	6.23%	5.10%	5.31%	5.00%	4.44%	4.13%	4.23%	4.55%	4.83%	5.02%	5.10%	5.07%	6.11%
2005	4.41%	10.81%	11.10%	7.88%	7.22%	5.81%	5.37%	7.87%	14.70%	8.51%	8.58%	8.94%	9.51%	8.84%	8.85%	9.03%	5.19%	3.74%	3.83%	3.61%	3.25%	3.05%	2.98%	3.29%	3.50%	3.73%	3.78%	4.04%	4.19%	4.30%
2006	1.60%	7.50%	9.05%	12.30%	7.81%	6.49%	9.49%	17.13%	9.66%	9.47%	9.13%	9.49%	8.30%	7.53%	8.34%	6.09%	4.08%	4.16%	3.96%	3.53%	3.21%	3.17%	3.38%	3.70%	3.84%	4.15%	4.28%	4.61%	4.74%	5.30%
2007	1.55%	10.93%	16.47%	8.46%	6.23%	8.81%	16.32%	10.15%	9.24%	8.89%	9.62%	8.03%	6.92%	7.49%	6.38%	5.05%	4.52%	4.14%	3.57%	3.34%	3.40%	3.55%	3.62%	3.83%	4.32%	4.47%	4.67%	4.88%	5.07%	5.55%
2008	2.19%	22.86%	12.20%	7.93%	12.05%	21.96%	12.39%	10.50%	10.22%	10.69%	8.86%	7.65%	8.32%	6.87%	5.67%	5.32%	4.15%	3.31%	3.09%	3.10%	3.30%	3.43%	3.74%	3.87%	4.24%	4.50%	4.84%	5.03%	5.01%	5.19%
2009	5.88%	8.37%	7.37%	15.10%	25.37%	12.03%	15.57%	16.69%	15.64%	11.84%	10.05%	12.46%	8.41%	6.26%	5.68%	4.49%	3.18%	2.78%	2.71%	2.85%	3.00%	3.27%	3.37%	3.44%	3.71%	3.86%	4.10%	4.32%	4.41%	4.49%
2010	1.44%	4.34%	9.35%	17.10%	10.52%	17.75%	18.77%	17.45%	13.45%	11.42%	15.17%	10.70%	7.70%	6.55%	5.80%	4.27%	3.13%	2.84%	2.84%	3.03%	3.17%	3.28%	3.38%	3.60%	3.85%	4.03%	4.23%	4.29%	4.47%	4.59%
2011	0.50%	7.54%	15.66%	11.10%	18.12%	18.96%	17.46%	13.50%	11.73%	15.57%	10.14%	7.12%	6.28%	5.20%	4.90%	3.67%	2.60%	2.44%	2.46%	2.68%	2.74%	2.72%	3.02%	3.10%	3.27%	3.47%	3.63%	3.62%	3.80%	4.04%
2012	0.87%	8.53%	9.34%	16.40%	16.91%	16.38%	13.04%	11.23%	14.55%	7.72%	5.68%	5.16%	4.44%	3.82%	4.02%	2.99%	1.90%	1.81%	1.80%	1.91%	1.95%	2.06%	2.15%	2.29%	2.38%	2.57%	2.68%	2.79%	2.91%	3.02%
2013	0.98%	5.04%	13.20%	14.26%	14.32%	12.51%	10.97%	13.89%	5.33%	3.72%	3.51%	3.02%	2.62%	2.33%	2.43%	1.85%	1.43%	1.36%	1.39%	1.40%	1.51%	1.57%	1.66%	1.76%	1.82%	1.98%	2.10%	2.17%	2.16%	2.26%
2014	1.59%	27.26%	20.60%	18.41%	14.83%	13.33%	17.14%	8.47%	5.68%	5.09%	4.49%	3.67%	3.19%	2.90%	3.06%	2.46%	1.93%	1.88%	1.84%	1.94%	2.02%	2.05%	2.20%	2.25%	2.49%	2.59%	2.78%	2.84%	2.89%	3.07%
2015	3.18%	15.87%	17.10%	14.99%	14.21%	21.96%	9.01%	6.02%	5.22%	4.32%	3.80%	3.32%	3.13%	2.87%	2.84%	2.48%	2.01%	1.92%	1.94%	2.03%	2.10%	2.12%	2.31%	2.39%	2.44%	2.76%	2.76%	2.96%	3.06%	3.18%
2016	2.90%	10.75%	11.55%	13.06%	22.21%	9.62%	6.78%	5.95%	4.94%	4.23%	3.84%	3.57%	3.29%	3.07%	2.97%	2.59%	2.22%	2.05%	2.07%	2.12%	2.27%	2.35%	2.46%	2.67%	2.77%	2.99%	3.12%	3.26%	3.31%	3.54%
2017	1.79%	8.89%	11.81%	24.63%	9.34%	6.90%	6.58%	5.54%	4.65%	4.12%	4.12%	3.94%	3.62%	3.42%	3.16%	2.78%	2.42%	2.31%	2.29%	2.39%	2.49%	2.57%	2.74%	2.88%	3.07%	3.20%	3.45%	3.56%	3.67%	3.90%
2018	1.45%	13.48%	29.06%	12.30%	9.46%	8.91%	7.64%	6.21%	5.38%	4.95%	4.84%	4.62%	4.22%	3.85%	3.63%	3.20%	2.83%	2.70%	2.69%	2.72%	2.87%	3.04%	3.16%	3.34%	3.55%	3.79%	4.00%	4.08%	4.23%	4.52%
2019	4.35%	32.96%	13.59%	10.63%	9.62%	8.76%	7.37%	6.40%	5.79%	5.34%	5.31%	5.07%	4.52%	4.10%	3.83%	3.47%	3.06%	2.87%	2.91%	2.98%	3.15%	3.28%	3.42%	3.60%	3.87%	3.97%	4.30%	4.47%	4.51%	4.81%
2020	4.21%	5.48%	5.31%	5.33%	5.01%	4.66%	4.23%	3.97%	3.61%	3.42%	3.34%	3.04%	2.75%	2.53%	2.38%	2.17%	2.03%	1.91%	1.92%	2.02%	2.08%	2.17%	2.30%	2.46%	2.58%	2.70%	2.90%	3.04%	3.12%	3.30%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Cumulative Non-Claim Termination Rate
All Products Combined

Table 8: Cumulative Number of Non-Claim Terminations as of Each Evaluation Year
Total Number of Non-Claim Terminations for each Fiscal Year as of the End of the Evaluation Year

	Evaluation Year																													
Fiscal Year	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	2,405	16,970	86,404	271,194	397,137	422,365	456,092	479,491	512,168	542,894	556,375	570,881	588,354	604,693	615,450	622,016	628,819	631,402	633,149	634,730	635,841	637,021	637,974	638,936	640,001	640,999	641,962	642,973	644,313	646,258
1991	1,803	31,055	166,990	291,035	315,940	352,297	378,404	416,943	452,182	466,849	484,078	504,414	523,531	535,253	542,423	548,958	551,645	553,426	555,024	556,045	557,166	558,064	558,943	559,837	560,742	561,617	562,518	563,522	564,660	566,322
1992	3,505	52,979	138,378	169,472	217,937	256,053	317,139	375,587	398,982	429,052	464,900	500,427	519,230	530,206	538,086	543,028	545,811	547,772	549,368	550,761	552,019	553,326	554,583	555,796	557,081	558,335	559,624	561,006	562,528	563,410
1993	13,016	74,655	117,956	189,880	253,712	352,274	457,802	508,206	574,202	655,310	750,839	795,414	820,646	837,601	848,985	856,735	860,663	863,953	866,720	869,329	871,997	874,309	876,585	878,744	880,932	883,041	885,100	887,207	888,573	889,723
1994	10,915	45,989	127,406	202,897	322,724	445,113	507,603	590,538	688,819	809,355	870,340	906,093	929,566	945,321	957,914	964,753	969,074	972,919	976,581	980,494	983,719	986,693	989,765	992,780	995,802	998,504	1,001,093	1,002,985	1,004,656	1,006,200
1995	6,875	45,316	84,229	162,999	226,157	252,322	289,864	331,578	374,948	398,924	413,402	422,451	428,215	431,602	433,797	435,567	436,783	437,965	439,237	440,320	441,473	442,584	443,726	444,806	445,881	446,924	447,869	448,793	449,754	450,606
1996	3,846	32,223	154,051	269,704	315,303	385,360	462,662	545,843	589,777	615,630	631,352	641,116	647,061	651,095	654,511	657,175	659,161	661,378	663,331	665,190	667,026	668,841	670,552	672,204	673,822	675,448	676,928	678,548	680,034	681,306
1997	5,216	89,179	226,475	279,980	367,856	450,597	536,239	581,821	608,966	625,436	635,507	641,512	645,200	647,979	650,480	652,779	654,957	656,859	658,743	660,626	662,642	664,445	666,129	667,712	669,437	670,977	672,618	674,097	675,395	676,475
1998	14,110	94,596	155,100	270,754	421,617	624,720	723,134	778,396	809,011	827,285	838,349	846,289	852,137	857,215	862,260	868,024	871,700	875,212	878,680	882,216	885,346	888,072	890,769	893,700	896,335	899,128	901,532	903,628	905,408	907,015
1999	8,417	44,284	191,419	394,206	650,876	777,528	850,941	890,990	914,674	929,028	939,192	946,605	953,169	959,602	967,684	973,279	977,866	982,312	986,730	990,652	994,186	997,532	1,000,903	1,003,970	1,007,286	1,010,377	1,012,920	1,014,998	1,017,007	1,018,871
2000	5,054	199,864	393,046	536,003	602,941	641,710	663,325	675,880	682,671	686,803	689,587	691,670	693,827	696,443	698,674	700,778	702,789	704,670	706,478	708,076	709,628	711,239	712,723	714,354	715,916	717,239	718,384	719,503	720,607	721,611
2001	32,499	209,875	561,029	711,102	792,701	835,128	859,051	873,209	884,219	891,320	896,819	902,335	909,413	914,510	919,274	923,954	927,949	931,434	934,440	937,351	940,263	942,875	945,573	948,142	950,384	952,222	954,053	955,820	957,483	959,084
2002	35,873	379,552	582,616	709,396	777,091	817,723	841,680	861,760	875,069	885,644	896,383	910,491	919,808	928,399	936,878	944,970	950,619	955,536	960,132	964,368	967,950	971,508	974,822	977,512	979,972	982,330	984,570	986,815	989,079	991,104
2003	61,065	208,989	368,104	461,814	519,323	553,274	582,694	604,491	623,487	645,453	676,133	693,097	708,939	724,244	739,952	752,009	760,170	768,270	773,655	777,720	781,704	785,233	788,309	791,070	793,841	796,580	799,259	801,927	804,494	806,880
2004	45,769	195,641	302,452	371,635	410,292	443,147	467,046	487,286	511,576	547,612	567,277	584,972	601,880	618,758	634,042	644,781	654,310	661,019	666,220	671,309	675,721	679,461	682,787	686,041	689,368	692,647	695,883	698,994	701,920	704,630
2005	20,203	64,554	104,795	130,601	151,971	167,640	180,928	198,317	225,422	239,343	251,810	263,350	274,304	283,504	291,840	299,409	303,517	306,360	309,150	311,669	313,790	315,715	317,535	319,470	321,452	323,427	325,352	327,321	329,266	331,020
2006	6,313	33,567	63,023	97,425	116,741	131,169	149,554	176,283	189,347	200,514	209,936	218,584	225,402	231,058	236,766	240,603	243,052	245,439	247,610	249,468	251,075	252,607	254,184	255,844	257,491	259,177	260,840	262,542	264,207	265,771
2007	6,148	44,818	93,256	114,965	129,325	146,951	172,739	186,340	197,025	205,919	214,312	220,589	225,530	230,440	234,333	237,199	239,635	241,760	243,516	245,097	246,636	248,179	249,695	251,232	252,884	254,507	256,121	257,724	259,302	260,833
2008	22,137	208,518	294,261	343,964	407,935	495,709	536,726	566,314	590,928	613,164	629,562	642,387	655,083	664,813	672,336	678,868	683,717	687,433	690,788	694,032	697,342	700,656	704,124	707,569	711,173	714,814	718,532	722,197	725,666	728,935
2009	101,679	234,501	341,963	529,351	770,782	869,146	975,775	1,070,611	1,145,521	1,195,219	1,232,996	1,274,286	1,299,853	1,317,651	1,332,843	1,344,065	1,351,735	1,358,250	1,364,403	1,370,676	1,377,045	1,383,751	1,390,422	1,396,993	1,403,823	1,410,609	1,417,516	1,424,485	1,431,286	1,437,635
2010	23,715	91,840	225,302	430,481	542,729	700,864	839,314	947,352	1,019,870	1,074,626	1,137,458	1,177,315	1,203,824	1,224,926	1,242,482	1,254,595	1,263,195	1,270,766	1,278,110	1,285,698	1,293,337	1,300,976	1,308,588	1,316,399	1,324,435	1,332,477	1,340,559	1,348,422	1,356,236	1,363,426
2011	6,004	89,302	237,958	331,988	460,669	572,671	659,635	718,402	763,818	815,791	846,376	866,340	882,860	895,811	907,415	915,590	921,216	926,354	931,404	936,768	942,062	947,173	952,683	958,171	963,761	969,473	975,226	980,756	986,340	991,571
2012	10,273	102,434	194,433	332,394	453,220	553,112	623,065	676,932	737,688	767,528	788,210	806,027	820,685	832,803	845,028	853,639	859,008	864,037	868,934	874,038	879,102	884,339	889,706	895,284	900,946	906,842	912,826	918,881	925,014	930,973
2013	12,986	76,760	224,036	362,554	483,470	576,851	650,336	731,771	761,368	781,197	799,193	814,188	826,813	837,762	848,885	857,076	863,301	869,142	874,994	880,817	886,907	893,109	899,550	906,249	913,046	920,164	927,522	934,944	942,161	949,060
2014	12,278	177,929	281,289	358,681	412,507	454,848	501,112	522,071	535,297	546,511	555,931	563,326	569,538	575,004	580,589	584,910	588,236	591,403	594,447	597,582	600,751	603,895	607,179	610,455	613,975	617,466	621,102	624,709	628,269	631,704
2015	34,404	182,511	318,306	421,266	506,243	613,417	653,586	678,754	699,352	715,652	729,409	741,019	751,606	761,021	770,061	777,701	783,764	789,435	795,059	800,821	806,594	812,289	818,371	824,482	830,540	837,124	843,531	850,195	856,857	863,315
2016	35,508	154,094	267,988	381,365	538,452	600,198	640,676	674,011	700,249	721,729	740,474	757,213	772,125	785,592	798,234	808,924	817,875	825,946	833,935	841,939	850,205	858,565	867,103	876,067	885,087	894,403	903,815	913,305	922,611	931,625
2017	21,939	121,847	240,153	437,397	505,328	551,769	592,891	625,440	651,369	673,345	694,346	713,596	730,607	746,122	759,985	771,786	781,789	791,096	800,094	809,266	818,476	827,711	837,249	846,932	856,932	866,895	877,261	887,541	897,632	907,066
2018	14,502	133,139	330,763	404,689	455,966	499,685	533,991	559,962	581,098	599,455	616,470	631,920	645,384	657,147	667,816	676,858	684,619	691,811	698,783	705,616	712,553	719,652	726,784	734,054	741,495	749,086	756,776	764,276	771,695	778,739
2019	41,267	276,400	361,256	420,610	469,004	508,920	539,815	564,811	585,985	604,392	621,658	637,250	650,478	661,971	672,279	681,250	688,897	695,865	702,702	709,498	716,404	723,347	730,335	737,418	744,744	751,926	759,370	766,762	773,864	780,816
2020	52,782	117,749	177,229	233,558	283,640	327,794	366,021	400,283	430,189	457,508	483,167	505,791	525,612	543,365	559,596	574,079	587,292	599,440	611,445	623,787	636,148	648,760	661,788	675,342	689,183	703,083	717,461	731,890	745,942	759,336

Table 9: Cumulative Non-Claim Termination Rate = Table 8 / Table 1 (Evaluation Year 1)
Cumulative Non-Claim Terminations as of Evaluation Year Divided by Active Loans as of Evaluation Year 1

	Evaluation Year																													
Fiscal Year	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	0.34%	2.37%	12.06%	37.86%	55.44%	58.97%	63.67%	66.94%	71.50%	75.79%	77.67%	79.70%	82.14%	84.42%	85.92%	86.84%	87.79%	88.15%	88.39%	88.61%	88.77%	88.93%	89.07%	89.20%	89.35%	89.49%	89.62%	89.76%	89.95%	90.22%
1991	0.29%	5.01%	26.92%	46.91%	50.93%	56.79%	61.00%	67.21%	72.89%	75.25%	78.03%	81.31%	84.39%	86.28%	87.44%	88.49%	88.92%	89.21%	89.47%	89.63%	89.81%	89.96%	90.10%	90.24%	90.39%	90.53%	90.67%	90.84%	91.02%	91.29%
1992	0.58%	8.70%	22.72%	27.83%	35.79%	42.05%	52.08%	61.68%	65.52%	70.46%	76.35%	82.18%	85.27%	87.07%	88.37%	89.18%	89.64%	89.96%	90.22%	90.45%	90.65%	90.87%	91.08%	91.27%	91.49%	91.69%	91.90%	92.13%	92.38%	92.53%
1993	1.37%	7.83%	12.38%	19.93%	26.62%	36.97%	48.04%	53.33%	60.25%	68.77%	78.79%	83.47%	86.12%	87.89%	89.09%	89.90%	90.31%	90.66%	90.95%	91.22%	91.50%	91.75%	91.99%	92.21%	92.44%	92.66%	92.88%	93.10%	93.24%	93.36%
1994	1.00%	4.20%	11.62%	18.51%	29.44%	40.61%	46.31%	53.88%	62.84%	73.84%	79.40%	82.67%	84.81%	86.24%	87.39%	88.02%	88.41%	88.76%	89.10%	89.45%	89.75%	90.02%	90.30%	90.57%	90.85%	91.10%	91.33%	91.50%	91.66%	91.80%
1995	1.38%	9.07%	16.86%	32.63%	45.27%	50.51%	58.02%	66.37%	75.05%	79.85%	82.75%	84.56%	85.71%	86.39%	86.83%	87.19%	87.43%	87.67%	87.92%	88.14%	88.37%	88.59%	88.82%	89.03%	89.25%	89.46%	89.65%	89.83%	90.02%	90.20%
1996	0.51%	4.26%	20.36%	35.64%	41.67%	50.93%	61.15%	72.14%	77.95%	81.36%	83.44%	84.73%	85.52%	86.05%	86.50%	86.85%	87.11%	87.41%	87.67%	87.91%	88.15%	88.39%	88.62%	88.84%	89.05%	89.27%	89.46%	89.68%	89.87%	90.04%
1997	0.70%	11.94%	30.32%	37.48%	49.25%	60.32%	71.79%	77.89%	81.52%	83.73%	85.08%	85.88%	86.37%	86.75%	87.08%	87.39%	87.68%	87.94%	88.19%	88.44%	88.71%	88.95%	89.18%	89.39%	89.62%	89.83%	90.04%	90.24%	90.42%	90.56%
1998	1.44%	9.63%	15.78%	27.55%	42.90%	63.57%	73.58%	79.21%	82.32%	84.18%	85.31%	86.11%	86.71%	87.23%	87.74%	88.33%	88.70%	89.06%	89.41%	89.77%	90.09%	90.37%	90.64%	90.94%	91.21%	91.49%	91.74%	91.95%	92.13%	92.29%
1999	0.75%	3.95%	17.05%	35.12%	57.99%	69.27%	75.81%	79.38%	81.49%	82.77%	83.68%	84.34%	84.92%	85.50%	86.22%	86.71%	87.12%	87.52%	87.91%	88.26%	88.58%	88.88%	89.18%	89.45%	89.74%	90.02%	90.25%	90.43%	90.61%	90.78%
2000	0.63%	24.92%	49.01%	66.83%	75.18%	80.02%	82.71%	84.28%	85.12%	85.64%	85.98%	86.24%	86.51%	86.84%	87.12%	87.38%	87.63%	87.87%	88.09%	88.29%	88.48%	88.68%	88.87%	89.07%	89.27%	89.43%	89.58%	89.72%	89.85%	89.98%
2001	3.14%	20.26%	54.17%	68.66%	76.54%	80.63%	82.94%	84.31%	85.37%	86.06%	86.59%	87.12%	87.80%	88.30%	88.76%	89.21%	89.59%	89.93%	90.22%	90.50%	90.78%	91.04%	91.30%	91.54%	91.76%	91.94%	92.11%	92.29%	92.45%	92.60%
2002	3.31%	35.06%	53.82%	65.53%	71.78%	75.53%	77.75%	79.60%	80.83%	81.81%	82.80%	84.10%	84.96%	85.76%	86.54%	87.29%	87.81%	88.26%	88.69%	89.08%	89.41%	89.74%	90.05%	90.29%	90.52%	90.74%	90.95%	91.15%	91.36%	91.55%
2003	6.81%	23.30%	41.04%	51.49%	57.90%	61.69%	64.97%	67.40%	69.52%	71.96%	75.39%	77.28%	79.04%	80.75%	82.50%	83.85%	84.76%	85.66%	86.26%	86.71%	87.16%	87.55%	87.89%	88.20%	88.51%	88.81%	89.11%	89.41%	89.70%	89.96%
2004	5.41%	23.13%	35.75%	43.93%	48.50%	52.38%	55.21%	57.60%	60.47%	64.73%	67.06%	69.15%	71.15%	73.14%	74.95%	76.22%	77.35%	78.14%	78.75%	79.36%	79.88%	80.32%	80.71%	81.10%	81.49%	81.88%	82.26%	82.63%	82.97%	83.29%
2005	4.41%	14.10%	22.89%	28.52%	33.19%	36.61%	39.51%	43.31%	49.23%	52.27%	54.99%	57.51%	59.91%	61.92%	63.74%	65.39%	66.29%	66.91%	67.52%	68.07%	68.53%	68.95%	69.35%	69.77%	70.20%	70.63%	71.06%	71.49%	71.91%	72.29%
2006	1.60%	8.53%	16.02%	24.76%	29.67%	33.34%	38.01%	44.81%	48.13%	50.96%	53.36%	55.56%	57.29%	58.73%	60.18%	61.15%	61.78%	62.38%	62.93%	63.41%	63.81%	64.20%	64.60%	65.03%	65.45%	65.87%	66.30%	66.73%	67.15%	67.55%
2007	1.55%	11.32%	23.55%	29.03%	32.65%	37.10%	43.61%	47.05%	49.74%	51.99%	54.11%	55.69%	56.94%	58.18%	59.16%	59.89%	60.50%	61.04%	61.48%	61.88%	62.27%	62.66%	63.04%	63.43%	63.85%	64.26%	64.66%	65.07%	65.47%	65.85%
2008	2.19%	20.66%	29.16%	34.08%	40.42%	49.12%	53.18%	56.11%	58.55%	60.75%	62.38%	63.65%	64.91%	65.87%	66.62%	67.26%	67.74%	68.11%	68.45%	68.77%	69.09%	69.42%	69.77%	70.11%	70.47%	70.83%	71.19%	71.56%	71.90%	72.22%
2009	5.88%	13.56%	19.77%	30.61%	44.57%	50.26%	56.43%	61.91%	66.24%	69.12%	71.30%	73.69%	75.17%	76.20%	77.07%	77.72%	78.17%	78.54%	78.90%	79.26%	79.63%	80.02%	80.40%	80.78%	81.18%	81.57%	81.97%	82.37%	82.77%	83.13%
2010	1.44%	5.59%	13.71%	26.20%	33.03%	42.66%	51.08%	57.66%	62.07%	65.41%	69.23%	71.66%	73.27%	74.55%	75.62%	76.36%	76.88%	77.34%	77.79%	78.25%	78.72%	79.18%	79.65%	80.12%	80.61%	81.10%	81.59%	82.07%	82.55%	82.98%
2011	0.50%	7.50%	19.99%	27.89%	38.69%	48.10%	55.41%	60.34%	64.16%	68.52%	71.09%	72.77%	74.16%	75.24%	76.22%	76.91%	77.38%	77.81%	78.23%	78.68%	79.13%	79.56%	80.02%	80.48%	80.95%	81.43%	81.91%	82.38%	82.85%	83.29%
2012	0.87%	8.72%	16.56%	28.31%	38.60%	47.11%	53.07%	57.65%	62.83%	65.37%	67.13%	68.65%	69.90%	70.93%	71.97%	72.70%	73.16%	73.59%	74.01%	74.44%	74.87%	75.32%	75.78%	76.25%	76.73%	77.23%	77.74%	78.26%	78.78%	79.29%
2013	0.98%	5.76%	16.82%	27.22%	36.30%	43.32%	48.83%	54.95%	57.17%	58.66%	60.01%	61.14%	62.08%	62.91%	63.74%	64.36%	64.82%	65.26%	65.70%	66.14%	66.60%	67.06%	67.55%	68.05%	68.56%	69.09%	69.65%	70.20%	70.75%	71.26%
2014	1.59%	22.99%	36.34%	46.34%	53.29%	58.76%	64.74%	67.45%	69.16%	70.60%	71.82%	72.78%	73.58%	74.29%	75.01%	75.56%	75.99%	76.40%	76.80%	77.20%	77.61%	78.02%	78.44%	78.86%	79.32%	79.77%	80.24%	80.71%	81.17%	81.61%
2015	3.18%	16.87%	29.42%	38.94%	46.80%	56.70%	60.42%	62.74%	64.65%	66.15%	67.43%	68.50%	69.48%	70.35%	71.18%	71.89%	72.45%	72.97%	73.49%	74.03%	74.56%	75.09%	75.65%	76.21%	76.77%	77.38%	77.97%	78.59%	79.21%	79.80%
2016	2.90%	12.60%	21.92%	31.20%	44.04%	49.10%	52.41%	55.13%	57.28%	59.04%	60.57%	61.94%	63.16%	64.26%	65.29%	66.17%	66.90%	67.56%	68.21%	68.87%	69.55%	70.23%	70.93%	71.66%	72.40%	73.16%	73.93%	74.71%	75.47%	76.21%
2017	1.79%	9.95%	19.61%	35.72%	41.27%	45.06%	48.42%	51.08%	53.20%	54.99%	56.71%	58.28%	59.67%	60.93%	62.07%	63.03%	63.85%	64.61%	65.34%	66.09%	66.84%	67.60%	68.38%	69.17%	69.98%	70.80%	71.64%	72.48%	73.31%	74.08%
2018	1.45%	13.31%	33.07%	40.47%	45.59%	49.97%	53.40%	55.99%	58.11%	59.94%	61.64%	63.19%	64.53%	65.71%	66.78%	67.68%	68.46%	69.18%	69.87%	70.56%	71.25%	71.96%	72.67%	73.40%	74.14%	74.90%	75.67%	76.42%	77.16%	77.87%
2019	4.35%	29.12%	38.06%	44.32%	49.41%	53.62%	56.87%	59.51%	61.74%	63.68%	65.50%	67.14%	68.53%	69.75%	70.83%	71.78%	72.58%	73.32%	74.04%	74.75%	75.48%	76.21%	76.95%	77.69%	78.47%	79.22%	80.01%	80.79%	81.53%	82.27%
2020	4.21%	9.40%	14.15%	18.65%	22.65%	26.17%	29.22%	31.96%	34.35%	36.53%	38.58%	40.38%	41.97%	43.38%	44.68%	45.83%	46.89%	47.86%	48.82%	49.80%	50.79%	51.80%	52.84%	53.92%	55.02%	56.13%	57.28%	58.43%	59.56%	60.63%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Conditional Loss Rate
All Products Combined

Table 10: Gross Claim Cost in Each Evaluation Year

	Evaluation Year																													
Fiscal Year	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	3,073,174	124,854,855	521,827,531	794,117,977	760,854,723	559,640,821	392,947,969	337,655,896	247,057,639	174,950,520	119,346,143	66,058,334	44,896,058	35,171,832	24,037,832	14,885,040	10,705,345	8,648,959	7,818,831	6,023,987	7,744,467	6,992,825	4,616,051	5,528,983	2,908,573	3,217,871	3,990,748	1,738,932	1,543,243	1,102,182
1991	2,601,471	106,549,442	452,398,345	597,157,333	534,014,121	415,155,313	382,806,216	297,468,849	207,041,980	139,939,821	79,385,696	52,454,202	36,139,332	26,381,667	16,911,592	10,884,389	6,712,986	6,823,640	5,734,226	6,516,084	6,591,393	5,496,206	5,850,255	3,526,153	4,109,522	4,773,898	2,455,285	1,554,877	1,645,891	507,409
1992	1,257,151	79,245,922	296,710,764	398,894,729	418,747,359	461,333,990	396,563,055	293,039,318	198,846,063	113,306,259	73,424,183	48,221,368	30,062,384	17,110,250	12,314,692	7,694,142	7,377,663	7,121,684	6,376,948	7,198,431	5,709,122	6,669,532	3,982,410	4,907,255	5,205,412	3,592,629	1,854,464	1,269,562	498,599	191,915
1993	3,105,635	112,248,769	408,025,830	612,730,051	825,743,989	747,686,886	568,546,067	377,671,437	203,516,927	135,075,924	91,607,385	57,744,087	32,377,027	20,133,030	14,539,564	12,044,835	11,141,128	13,094,748	13,721,607	9,888,056	13,545,314	8,821,222	11,519,475	10,822,674	7,370,112	3,437,009	2,036,814	1,131,727	1,127,041	1,112,950
1994	5,342,530	176,333,428	587,401,839	1,000,669,862	1,101,747,340	889,081,139	584,955,106	333,877,011	222,357,968	157,425,886	94,925,866	54,981,551	34,405,882	23,529,121	18,666,019	19,267,137	25,572,832	20,038,430	16,295,213	21,929,321	15,469,208	14,214,905	15,737,018	9,392,046	6,206,187	3,282,303	1,562,578	1,875,681	1,614,991	1,512,512
1995	2,501,812	93,316,824	463,918,739	761,846,821	728,291,878	505,709,362	313,627,490	203,921,120	175,766,898	109,031,001	58,384,673	36,742,446	24,051,173	20,083,215	20,030,266	22,362,286	19,216,484	14,657,973	16,215,029	11,572,887	13,618,399	15,865,408	8,543,407	6,240,593	4,174,910	1,121,079	1,533,189	1,192,296	1,128,552	758,184
1996	1,351,909	165,904,906	800,034,525	1,177,978,393	951,388,574	629,632,383	437,156,004	363,066,236	217,714,899	120,985,507	74,866,428	47,904,801	42,543,643	38,378,855	44,379,039	35,408,684	32,916,812	33,892,590	23,351,860	27,055,544	28,527,638	17,281,160	10,675,778	7,406,679	3,083,570	3,358,681	2,145,638	2,188,709	1,962,315	1,188,068
1997	2,312,490	209,520,325	871,136,632	1,036,202,503	782,310,180	620,729,248	509,239,079	307,578,740	179,049,772	106,143,841	69,214,111	59,570,684	50,397,628	57,866,631	46,718,773	40,137,749	43,674,531	33,249,486	34,249,405	35,027,172	21,979,367	13,420,248	7,295,259	4,910,517	4,818,347	4,370,718	3,447,178	2,081,241	2,466,849	2,092,539
1998	3,588,997	249,202,231	903,574,611	966,283,975	871,840,362	817,838,990	530,271,002	320,535,520	194,164,898	129,677,144	108,025,882	99,399,492	107,799,551	94,214,664	83,510,126	86,688,071	63,998,303	65,545,222	66,323,625	34,031,856	21,067,376	10,712,631	7,404,532	5,521,095	6,805,567	5,997,901	4,737,180	4,369,774	3,197,495	2,541,983
1999	3,227,094	273,468,805	958,272,844	1,326,822,674	1,479,064,509	1,012,326,848	597,995,380	341,935,232	223,133,616	186,517,702	170,775,211	179,917,835	167,959,493	143,881,396	143,720,099	98,368,180	98,467,711	95,384,688	53,169,256	37,692,715	19,883,390	10,502,234	10,575,814	10,688,748	11,141,690	7,747,879	6,765,590	6,182,911	3,987,902	2,649,246
2000	3,753,739	280,658,854	1,126,493,083	1,628,030,502	1,149,055,865	647,128,028	373,769,869	249,417,430	205,410,361	167,431,174	176,031,330	139,394,114	116,330,932	119,208,583	83,791,685	82,138,537	76,375,119	48,004,966	35,836,653	18,613,141	10,848,946	7,574,302	8,833,403	7,640,969	6,995,719	5,710,209	4,882,889	4,339,677	2,689,989	2,209,277
2001	1,387,781	325,431,463	1,502,526,228	1,698,154,369	1,165,796,639	713,508,172	468,911,904	383,736,561	327,839,495	354,312,524	308,889,978	251,377,530	245,265,127	161,608,162	159,174,029	134,303,108	82,227,082	48,991,588	27,561,446	15,979,201	13,788,600	15,231,767	12,683,504	9,364,276	9,000,006	7,653,613	6,230,513	5,499,427	3,709,022	2,776,957
2002	2,934,027	403,921,771	1,510,010,841	1,460,106,274	1,016,726,348	720,377,061	600,412,393	531,523,138	563,764,579	476,159,197	425,735,647	425,288,727	275,851,084	249,559,113	220,338,665	119,983,051	71,840,188	43,057,418	21,064,378	21,805,272	22,135,302	16,956,142	12,697,126	10,347,460	9,132,284	6,656,523	6,817,774	5,453,972	5,461,757	2,799,904
2003	3,052,191	494,399,814	1,142,671,361	998,986,659	817,062,978	782,492,763	747,123,659	871,560,589	735,145,804	707,270,130	730,009,330	497,524,121	387,480,225	317,037,235	167,100,664	92,714,318	50,955,720	24,608,541	32,839,150	27,266,903	23,821,527	18,338,929	12,836,611	13,487,346	10,891,052	10,631,567	9,436,844	7,198,571	6,960,991	3,769,697
2004	67,639,436	730,083,174	1,111,244,453	1,188,162,577	1,285,692,738	1,214,186,685	1,319,063,233	1,072,126,429	1,070,139,039	1,098,110,744	764,178,020	600,568,531	485,560,637	248,286,661	142,659,478	73,427,044	40,281,216	48,501,567	40,419,946	33,319,637	27,928,556	21,967,190	19,406,960	16,349,301	15,656,786	13,725,407	11,485,139	9,328,195	7,297,338	5,305,721
2005	26,562,569	331,419,975	840,378,171	1,115,088,956	1,229,037,178	1,323,865,837	1,094,433,530	1,047,756,293	1,096,983,073	776,425,729	609,808,061	470,809,774	249,635,654	135,906,074	80,781,443	37,574,079	46,997,636	35,736,701	27,556,630	23,835,171	16,963,821	16,232,322	13,734,668	12,856,637	12,352,664	10,539,916	8,995,662	6,836,343	5,869,725	3,237,463
2006	9,997,700	318,035,668	1,010,328,222	1,480,399,145	1,756,160,030	1,349,604,434	1,295,663,831	1,410,038,519	962,330,531	735,156,367	592,879,747	324,204,168	200,509,194	107,815,100	56,329,122	52,725,155	41,223,343	32,033,719	29,643,507	23,139,841	19,507,729	15,804,927	12,061,563	12,417,500	12,403,385	8,717,642	7,322,302	7,017,168	4,103,836	4,656,575
2007	8,877,186	449,947,262	1,541,932,260	2,211,275,036	1,613,585,494	1,791,027,578	2,343,825,012	1,447,598,554	1,023,838,958	843,837,944	495,425,656	273,640,425	166,938,040	91,218,273	66,374,403	66,675,680	51,357,581	39,686,364	32,129,407	26,773,740	21,195,479	18,776,234	16,375,695	16,122,401	14,578,994	13,937,656	8,825,225	8,639,966	5,847,894	4,037,328
2008	20,494,138	1,079,033,031	4,076,866,992	3,965,321,084	4,722,715,447	6,677,336,357	4,229,118,616	2,823,783,471	2,282,940,024	1,285,285,592	705,021,733	432,978,041	236,744,239	197,780,807	172,071,756	124,893,010	100,702,908	77,081,991	67,771,301	57,172,949	47,353,800	35,728,947	36,052,596	28,892,073	26,786,953	22,817,387	19,983,878	15,532,865	13,045,292	9,435,205
2009	34,088,496	1,353,230,407	3,049,237,366	4,449,392,734	7,145,957,627	5,363,737,899	3,777,904,570	3,015,405,650	1,715,721,552	967,992,653	578,428,337	310,084,392	287,101,484	235,250,577	173,082,046	146,771,712	106,321,121	94,333,035	70,622,070	59,455,849	55,628,050	39,603,799	32,905,642	24,753,561	25,452,429	20,060,015	17,715,875	14,338,369	11,571,030	7,443,141
2010	18,228,050	450,168,603	1,408,222,796	2,857,805,757	2,837,881,039	2,340,151,913	1,763,189,884	1,061,996,707	630,110,830	396,713,864	206,577,422	240,855,721	207,680,274	136,083,789	102,589,763	80,608,796	77,678,857	77,912,629	51,325,792	37,286,789	36,317,244	28,759,904	27,167,223	22,455,801	20,711,973	16,794,091	13,837,439	10,941,543	9,420,684	6,472,325
2011	10,512,283	255,726,941	868,033,878	1,089,201,677	1,046,102,740	847,042,353	569,776,236	329,655,124	220,607,023	117,543,758	177,383,406	138,669,669	101,793,200	77,179,856	65,145,829	63,894,440	57,355,147	34,231,976	29,343,318	25,075,962	21,616,613	19,183,670	16,667,059	12,807,721	15,853,408	9,841,693	9,300,815	8,563,811	5,967,436	4,117,773
2012	8,662,792	156,324,538	458,148,257	611,103,636	649,330,673	470,987,326	298,685,365	216,375,542	116,058,941	172,676,806	158,771,209	113,297,268	73,638,111	62,857,472	64,195,688	52,781,241	43,361,925	44,871,926	35,185,268	26,134,943	21,905,974	16,252,468	17,155,616	12,933,171	12,904,897	10,927,985	10,118,994	7,961,054	6,057,470	3,745,168
2013	6,722,064	163,008,679	432,815,296	597,110,219	566,612,463	393,692,842	293,724,086	169,700,346	256,229,841	286,944,778	180,634,178	151,982,023	134,116,271	128,939,989	119,693,083	107,537,246	89,077,147	82,815,864	64,464,480	61,106,057	44,954,570	33,772,498	32,395,933	30,611,286	25,689,645	21,917,591	18,609,275	14,881,033	14,299,551	8,583,007
2014	834,183	75,392,326	246,199,746	376,506,249	285,820,505	230,209,273	141,738,596	188,195,569	161,489,102	130,177,763	104,939,861	71,875,785	64,548,808	52,268,229	42,266,819	38,094,089	33,926,686	28,383,000	23,817,722	16,686,259	17,705,692	12,438,082	9,888,806	12,130,667	10,258,857	7,797,664	5,478,598	5,649,211	4,367,108	3,002,630
2015	1,227,990	57,248,452	271,554,127	338,342,635	343,563,635	229,351,420	344,976,049	341,784,606	270,606,287	176,335,094	121,453,782	100,303,297	88,019,356	74,937,070	62,354,675	55,579,006	44,580,810	34,951,681	35,176,208	24,642,783	20,658,631	18,695,937	12,694,806	14,496,107	12,173,004	10,520,993	7,140,977	7,132,370	6,455,808	4,198,506
2016	1,011,785	59,901,586	237,232,258	367,963,107	290,281,455	580,738,827	536,561,885	416,756,824	338,125,017	223,898,629	182,269,893	156,443,192	123,739,042	122,826,158	90,184,793	79,471,512	66,097,894	61,201,437	41,679,067	36,352,644	26,075,718	24,661,674	19,898,761	16,655,388	16,343,585	14,655,653	11,726,494	9,907,596	8,263,137	6,732,118
2017	1,410,313	58,309,764	260,842,677	314,343,810	809,269,229	1,071,040,041	836,876,289	643,431,729	445,469,240	374,924,759	296,479,298	236,490,783	194,783,635	158,626,992	132,419,087	114,457,093	83,349,550	71,016,569	59,186,816	51,738,968	39,566,031	34,499,309	27,151,871	26,949,419	22,737,187	24,628,498	19,154,731	12,312,652	12,240,896	6,832,001
2018	1,706,489	68,276,000	216,439,139	750,803,909	1,164,177,377	1,052,057,355	883,424,438	713,594,414	559,018,566	489,267,602	372,094,265	283,285,884	225,687,615	176,909,836	151,421,517	117,070,964	95,359,243	73,324,969	65,061,817	70,472,154	47,297,624	38,040,078	30,983,324	30,983,768	28,566,250	23,809,592	21,873,817	20,768,170	14,430,767	9,074,699
2019	1,246,515	35,068,232	588,045,789	1,009,507,291	1,065,049,848	916,482,101	789,239,780	606,684,941	496,886,965	421,589,974	344,206,778	273,853,282	196,207,217	158,245,723	138,743,047	112,076,338	100,995,690	76,987,096	69,181,328	50,049,728	49,945,884	34,412,737	32,337,895	28,273,502	26,428,051	20,196,957	18,453,282	15,834,448	14,543,506	9,394,634
2020	240,882	335,098,595	758,776,865	1,077,872,159	1,262,115,229	1,086,025,875	1,020,537,584	866,670,066	747,449,287	640,923,088	556,252,560	484,482,814	439,206,068	317,695,164	264,417,948	242,016,654	228,846,095	174,537,800	140,674,525	122,293,991	91,516,595	77,988,121	66,014,834	60,136,087	48,999,003	40,289,711	37,862,015	29,767,118	20,303,631	14,056,554

Table 11: Claim Cost Net of Recovery in Each Evaluation Year

	Evaluation Year																													
Fiscal Year	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	2,480,479	67,264,859	258,247,039	394,126,058	389,321,121	292,125,312	211,515,835	170,278,261	111,096,623	78,732,659	50,552,815	26,056,074	18,470,356	13,931,272	9,463,993	6,925,747	5,535,933	5,307,801	5,751,762	4,020,893	5,534,902	5,011,425	3,094,163	3,207,508	1,513,325	1,993,388	2,398,457	754,149	790,535	470,105
1991	1,005,047	55,306,659	231,482,439	309,023,487	284,768,698	226,478,077	194,623,844	135,615,292	92,039,874	55,731,788	30,156,829	18,504,260	12,100,737	9,675,630	6,677,875	5,284,097	4,319,912	5,079,637	3,785,191	4,375,474	4,385,438	3,462,831	3,337,319	1,958,515	2,401,459	2,495,344	1,337,099	865,923	801,405	303,887
1992	521,537	42,596,243	160,800,832	213,665,478	228,510,364	229,599,679	170,490,103	123,665,923	76,710,285	37,492,828	21,178,227	13,618,877	9,650,670	7,050,553	5,295,349	4,159,688	4,869,082	4,229,241	4,236,979	4,866,452	3,206,054	3,709,434	1,922,445	2,235,833	2,635,233	1,919,805	680,580	383,585	191,641	115,720
1993	1,102,429	61,998,369	226,995,772	329,358,722	396,930,202	310,262,371	220,330,492	133,364,011	58,970,177	36,655,509	25,921,479	17,552,055	11,640,391	9,019,342	7,495,488	7,445,519	6,848,045	8,010,619	8,480,319	5,736,468	6,746,240	3,848,322	5,467,302	5,958,516	3,867,778	1,794,469	1,012,121	788,609	649,511	610,025
1994	2,844,572	103,027,855	333,393,684	481,688,811	433,039,036	328,966,766	193,193,973	94,098,065	57,241,023	43,018,530	26,371,406	20,720,335	13,633,200	12,105,390	11,632,581	10,587,399	15,801,562	12,410,052	9,981,596	12,314,130	6,802,298	7,465,344	8,943,233	4,801,860	2,288,255	2,053,417	885,331	1,088,000	973,889	863,688
1995	1,209,908	55,268,147	213,713,573	292,117,213	268,323,294	177,881,673	95,983,498	58,852,783	55,042,955	33,846,784	20,679,100	14,100,381	13,454,647	12,350,686	12,141,810	14,401,692	12,373,718	9,125,920	9,036,031	6,344,658	7,917,612	8,538,975	4,233,298	3,012,215	2,291,980	716,622	893,055	710,539	713,861	462,741
1996	577,846	67,658,857	301,619,143	426,845,763	318,851,722	188,765,056	122,959,058	111,383,142	67,906,711	42,123,199	30,304,543	23,949,160	25,411,700	24,052,438	28,131,768	23,724,817	21,011,869	18,891,632	12,563,448	15,629,072	17,028,053	9,977,242	5,999,009	4,365,344	1,626,614	1,929,216	1,344,043	1,325,622	1,269,730	742,010
1997	773,629	85,096,379	334,763,178	352,802,974	237,009,167	178,328,518	155,703,206	95,259,103	61,669,459	40,679,339	34,459,885	35,868,431	30,478,228	37,314,192	30,439,093	25,106,108	26,853,908	17,574,589	19,332,458	20,715,867	13,256,367	7,382,855	4,048,631	2,830,773	2,931,150	2,696,872	2,234,881	1,410,352	1,585,811	1,270,510
1998	1,405,795	100,876,807	311,719,537	287,191,546	240,771,425	245,738,663	159,358,353	105,892,573	74,853,613	65,970,363	63,728,289	60,560,722	68,831,571	62,199,508	54,859,489	52,651,569	34,891,709	37,030,355	42,534,288	22,692,805	12,403,717	6,486,146	4,572,911	3,450,590	4,510,312	3,683,736	3,113,739	2,629,957	1,873,764	1,392,981
1999	1,235,574	102,573,315	308,718,706	377,448,782	443,955,926	311,425,559	210,879,838	128,654,033	108,895,293	109,681,012	100,280,707	111,859,351	112,504,139	92,753,706	87,241,263	56,440,910	57,290,647	58,345,914	34,874,268	24,613,488	12,662,933	7,418,370	6,571,503	6,541,708	6,930,544	4,729,212	4,099,124	3,482,737	2,217,245	1,484,658
2000	1,306,399	98,461,984	353,654,417	547,062,899	387,704,089	238,399,484	153,552,521	123,819,632	123,959,646	102,567,470	115,746,110	96,657,646	79,603,830	74,187,433	49,337,587	52,460,910	50,462,822	32,292,121	23,692,635	11,562,888	7,542,502	4,698,823	5,494,434	4,849,690	4,875,801	3,586,674	3,146,853	2,432,646	1,562,437	1,251,539
2001	427,509	108,203,812	538,345,075	599,624,405	435,236,646	288,140,244	230,084,550	226,028,566	199,308,865	227,261,748	210,120,392	167,993,760	154,090,159	97,240,400	98,611,336	87,953,625	54,921,762	33,349,178	18,541,569	11,300,843	8,381,357	9,076,166	8,245,855	5,958,000	5,259,250	4,701,115	3,574,780	3,322,774	2,134,284	1,476,469
2002	998,154	148,895,183	571,927,681	574,160,956	407,916,409	343,974,255	332,898,135	313,383,395	356,866,692	314,305,870	281,301,285	261,373,704	161,735,063	154,504,745	140,457,432	81,892,617	48,334,547	28,588,187	13,290,791	12,567,168	12,574,361	10,333,616	7,704,190	6,149,123	5,448,655	3,839,505	3,859,950	3,123,377	3,049,298	1,592,848
2003	1,299,438	218,175,717	481,930,357	401,681,200	376,138,196	424,374,263	425,206,551	535,977,456	469,323,477	453,441,835	442,350,309	279,737,157	223,139,067	193,806,275	111,595,866	65,517,007	35,107,156	15,743,830	19,094,493	16,221,183	13,719,353	12,333,083	8,136,360	8,275,239	6,526,298	6,170,955	5,219,148	4,154,061	3,683,295	2,063,404
2004	30,974,357	323,687,131	455,657,866	552,119,948	701,436,722	709,206,566	817,242,880	705,842,803	699,724,422	680,280,692	429,701,720	357,768,882	303,085,788	169,534,463	97,331,637	51,816,632	27,133,476	29,690,975	24,556,195	19,386,560	17,686,902	13,826,516	11,492,348	9,920,841	8,981,036	7,982,359	6,367,045	5,395,551	4,173,380	2,848,146
2005	10,396,998	136,679,389	399,711,631	620,174,419	729,155,904	848,412,839	730,851,654	704,143,602	707,320,541	467,947,871	375,608,243	308,281,161	177,547,120	97,884,695	58,505,197	25,422,570	29,428,458	22,059,426	17,787,095	16,079,351	11,417,862	10,748,063	8,543,350	8,237,298	7,550,914	6,235,874	5,427,019	4,212,675	3,559,048	1,858,980
2006	4,643,483	152,764,697	576,991,537	912,031,836	1,163,507,730	943,256,699	897,087,025	945,536,437	610,351,309	479,077,620	406,912,625	234,730,473	150,108,710	79,178,522	42,378,336	34,564,404	27,471,794	20,956,246	19,551,953	14,805,206	12,219,519	10,078,726	7,676,399	7,461,103	7,659,175	5,235,527	4,411,883	4,132,032	2,468,400	2,775,240
2007	5,016,624	259,919,027	949,151,865	1,489,859,306	1,145,737,151	1,264,975,399	1,576,401,144	927,727,138	671,063,922	584,801,161	354,695,159	206,206,135	126,544,312	70,165,304	44,862,987	45,399,719	33,982,480	26,733,221	21,010,510	17,576,740	14,217,131	12,297,606	10,292,109	10,189,370	9,126,996	8,695,846	5,622,623	5,449,248	3,705,155	2,497,129
2008	11,963,289	665,877,386	2,666,296,591	2,767,331,579	3,262,508,711	4,264,892,607	2,562,565,424	1,755,390,556	1,513,877,352	912,530,592	530,487,246	328,727,533	181,773,624	128,971,324	112,498,070	84,284,953	69,656,964	52,730,173	44,822,845	37,911,889	30,787,456	23,095,651	23,845,747	18,842,287	17,334,824	14,969,385	12,672,917	10,011,359	8,216,136	5,733,942
2009	22,688,337	856,771,987	2,019,300,831	2,912,630,888	4,195,094,686	2,958,294,555	2,175,409,569	1,863,366,226	1,159,848,990	702,000,050	422,528,681	231,290,958	184,821,546	150,495,625	114,098,821	98,951,261	73,106,147	58,953,886	44,816,926	37,657,623	37,208,738	23,837,194	21,076,175	14,878,988	15,274,283	12,770,318	11,300,842	8,975,782	7,110,077	4,394,386
2010	12,030,829	300,975,147	893,318,337	1,572,172,188	1,409,401,179	1,222,689,485	1,023,843,700	685,392,375	429,448,421	277,228,885	140,468,277	144,328,532	128,324,749	86,093,532	69,090,324	53,111,692	48,517,587	51,728,001	31,175,185	22,909,266	21,595,451	17,188,169	16,207,275	13,382,275	12,422,163	10,264,901	8,064,671	6,603,572	5,559,322	3,687,918
2011	7,151,361	170,674,052	487,199,227	499,134,657	508,589,691	479,052,990	351,478,972	212,921,614	142,993,232	74,575,800	107,960,669	82,917,537	61,925,580	50,684,382	41,140,976	42,116,544	35,746,326	21,513,367	17,632,463	14,978,129	12,481,551	11,001,584	9,714,541	7,348,252	8,885,724	5,494,888	5,233,930	4,803,462	3,285,411	2,244,683
2012	4,005,653	99,275,184	216,705,817	302,513,843	350,641,275	287,872,850	194,256,755	135,259,612	71,813,901	102,752,293	93,765,706	69,633,415	47,799,413	39,185,292	38,585,444	31,147,968	24,858,472	28,720,655	19,572,262	15,309,447	12,744,374	9,927,556	10,178,299	7,626,398	7,647,474	6,486,631	5,919,745	4,770,302	3,452,237	2,110,448
2013	4,094,555	79,514,653	219,449,353	329,911,826	333,248,453	252,934,070	188,978,107	111,418,203	141,743,114	168,096,557	108,889,759	95,311,143	83,662,136	78,198,532	70,797,450	63,216,940	51,836,373	46,149,192	36,519,539	33,105,629	26,051,312	19,839,279	17,922,683	17,658,034	14,641,448	12,528,499	10,523,136	8,267,391	7,565,232	4,494,113
2014	273,515	34,274,660	119,813,614	199,795,529	171,387,453	138,647,544	89,273,603	106,030,528	90,202,039	76,848,953	67,716,670	42,307,607	38,712,977	31,603,565	24,407,951	22,313,388	19,669,604	16,066,464	13,360,736	9,758,578	10,453,982	6,900,031	5,920,677	6,580,386	5,887,811	4,469,023	3,118,416	3,260,718	2,502,520	1,704,963
2015	286,781	30,070,848	144,474,571	197,221,340	207,062,253	147,328,538	196,906,293	193,359,874	166,975,670	110,206,236	74,589,945	60,760,138	51,995,580	45,207,374	37,157,600	31,996,140	25,960,649	20,810,252	20,142,183	13,984,383	12,456,936	10,670,521	7,513,570	8,095,930	6,938,349	6,144,277	4,154,369	3,976,918	3,412,609	2,272,635
2016	495,821	36,575,468	144,048,893	229,763,388	190,260,129	318,606,442	301,250,438	247,578,753	211,500,393	142,978,520	110,052,659	92,969,136	74,598,786	75,345,485	54,515,931	46,822,581	38,440,521	38,530,315	24,393,735	21,326,322	14,860,568	14,018,751	11,874,216	9,790,444	9,488,561	8,685,730	6,916,937	5,792,151	4,817,404	3,602,043
2017	594,813	35,699,030	165,360,306	204,661,062	417,618,614	581,200,361	479,830,444	392,470,055	265,841,456	221,482,855	173,204,624	134,190,224	112,096,551	91,258,779	74,745,806	67,431,326	46,662,782	40,353,982	32,869,999	28,728,382	21,865,708	19,135,225	15,858,280	15,057,368	12,709,876	13,677,382	10,563,559	6,983,229	6,433,650	3,814,211
2018	799,188	45,266,060	143,888,603	390,183,746	654,969,768	603,700,476	533,803,249	412,684,625	322,292,288	284,450,871	221,294,440	163,239,390	130,332,645	99,897,910	88,179,680	66,017,671	53,555,433	42,169,194	36,079,436	42,011,104	26,623,429	22,053,085	18,242,731	16,757,428	15,845,231	13,547,426	12,073,221	11,520,128	7,789,962	4,845,677
2019	839,177	24,660,292	313,637,882	586,173,145	634,065,738	552,442,842	482,160,648	362,417,584	298,741,760	246,880,949	205,148,003	158,918,835	113,126,279	91,896,137	80,015,767	64,354,565	61,861,451	45,677,219	39,806,577	29,383,538	29,084,229	20,854,324	17,740,198	16,628,214	15,495,262	11,725,474	10,351,301	9,215,501	8,381,655	5,250,082
2020	0	197,503,111	442,666,005	661,227,864	798,324,644	680,111,026	637,681,092	520,289,740	449,968,840	385,555,415	327,487,023	289,648,424	265,514,722	188,699,256	155,163,171	140,285,361	141,251,347	102,508,001	82,665,514	71,902,940	54,006,576	45,036,084	38,202,268	36,044,498	29,120,339	23,295,611	21,662,006	17,562,440	11,715,955	7,990,265

Table 12: Conditional Loss Severity = Table 11/Table 10
Loss Severity for Each Evaluation Year

	Evaluation Year																													
Fiscal Year	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	80.71%	53.87%	49.49%	49.63%	51.17%	52.20%	53.83%	50.43%	44.97%	45.00%	42.36%	39.44%	41.14%	39.61%	39.37%	46.53%	51.71%	61.37%	73.56%	66.75%	71.47%	71.67%	67.03%	58.01%	52.03%	61.95%	60.10%	43.37%	51.23%	42.65%
1991	38.63%	51.91%	51.17%	51.75%	53.33%	54.55%	50.84%	45.59%	44.45%	39.83%	37.99%	35.28%	33.48%	36.68%	39.49%	48.55%	64.35%	74.44%	66.01%	67.15%	66.53%	63.00%	57.05%	55.54%	58.44%	52.27%	54.46%	55.69%	48.69%	59.89%
1992	41.49%	53.75%	54.19%	53.56%	54.57%	49.77%	42.99%	42.20%	38.58%	33.09%	28.84%	28.24%	32.10%	41.21%	43.00%	54.06%	66.00%	59.39%	66.44%	67.60%	56.16%	55.62%	48.27%	45.56%	50.62%	53.44%	36.70%	30.21%	38.44%	60.30%
1993	35.50%	55.23%	55.63%	53.75%	48.07%	41.50%	38.75%	35.31%	28.98%	27.14%	28.30%	30.40%	35.95%	44.80%	51.55%	61.82%	61.47%	61.17%	61.80%	58.01%	49.80%	43.63%	47.46%	55.06%	52.48%	52.21%	49.69%	69.68%	57.63%	54.81%
1994	53.24%	58.43%	56.76%	48.14%	39.30%	37.00%	33.03%	28.18%	25.74%	27.33%	27.78%	37.69%	39.62%	51.45%	62.32%	54.95%	61.79%	61.93%	61.25%	56.15%	43.97%	52.52%	56.83%	51.13%	36.87%	62.56%	56.66%	58.01%	60.30%	57.10%
1995	48.36%	59.23%	46.07%	38.34%	36.84%	35.17%	30.60%	28.86%	31.32%	31.04%	35.42%	38.38%	55.94%	61.50%	60.62%	64.40%	64.39%	62.26%	55.73%	54.82%	58.14%	53.82%	49.55%	48.27%	54.90%	63.92%	58.25%	59.59%	63.25%	61.03%
1996	42.74%	40.78%	37.70%	36.24%	33.51%	29.98%	28.13%	30.68%	31.19%	34.82%	40.48%	49.99%	59.73%	62.67%	63.39%	67.00%	63.83%	55.74%	53.80%	57.77%	59.69%	57.73%	56.19%	58.94%	52.75%	57.44%	62.64%	60.57%	64.71%	62.46%
1997	33.45%	40.61%	38.43%	34.05%	30.30%	28.73%	30.58%	30.97%	34.44%	38.32%	49.79%	60.21%	60.48%	64.48%	65.15%	62.55%	61.49%	52.86%	56.45%	59.14%	60.31%	55.01%	55.50%	57.65%	60.83%	61.70%	64.83%	67.76%	64.28%	60.72%
1998	39.17%	40.48%	34.50%	29.72%	27.62%	30.05%	30.05%	33.04%	38.55%	50.87%	58.99%	60.93%	63.85%	66.02%	65.69%	60.74%	54.52%	56.50%	64.13%	66.68%	58.88%	60.55%	61.76%	62.50%	66.27%	61.42%	65.73%	60.19%	58.60%	54.80%
1999	38.29%	37.51%	32.22%	28.45%	30.02%	30.76%	35.26%	37.63%	48.80%	58.80%	58.72%	62.17%	66.98%	64.47%	60.70%	57.38%	58.18%	61.17%	65.59%	65.30%	63.69%	70.64%	62.14%	61.20%	62.20%	61.04%	60.59%	56.33%	55.60%	56.04%
2000	34.80%	35.08%	31.39%	33.60%	33.74%	36.84%	41.08%	49.64%	60.35%	61.26%	65.75%	69.34%	68.43%	62.23%	58.88%	63.87%	66.07%	67.27%	66.11%	62.12%	69.52%	62.04%	62.20%	63.47%	69.70%	62.81%	64.45%	56.06%	58.08%	56.65%
2001	30.81%	33.25%	35.83%	35.31%	37.33%	40.38%	49.07%	58.90%	60.79%	64.14%	68.02%	66.83%	62.83%	60.17%	61.95%	65.49%	66.79%	68.07%	67.27%	70.72%	60.78%	59.59%	65.01%	63.62%	58.44%	61.42%	57.38%	60.42%	57.54%	53.17%
2002	34.02%	36.86%	37.88%	39.32%	40.12%	47.75%	55.44%	58.96%	63.30%	66.01%	66.07%	61.46%	58.63%	61.91%	63.75%	68.25%	67.28%	66.40%	63.10%	57.63%	56.81%	60.94%	60.68%	59.43%	59.66%	57.68%	56.62%	57.27%	55.83%	56.89%
2003	42.57%	44.13%	42.18%	40.21%	46.04%	54.23%	56.91%	61.50%	63.84%	64.11%	60.60%	56.23%	57.59%	61.13%	66.78%	70.67%	68.90%	63.98%	58.15%	59.49%	57.59%	67.25%	63.38%	61.36%	59.92%	58.04%	55.31%	57.71%	52.91%	54.74%
2004	45.79%	44.34%	41.00%	46.47%	54.56%	58.41%	61.96%	65.84%	65.39%	61.95%	56.23%	59.57%	62.42%	68.28%	68.23%	70.57%	67.36%	61.22%	60.75%	58.18%	63.33%	62.94%	59.22%	60.68%	57.36%	58.16%	55.44%	57.84%	57.19%	53.68%
2005	39.14%	41.24%	47.56%	55.62%	59.33%	64.09%	66.78%	67.20%	64.48%	60.27%	61.59%	65.48%	71.12%	72.02%	72.42%	67.66%	62.62%	61.73%	64.55%	67.46%	67.31%	66.21%	62.20%	64.07%	61.13%	59.16%	60.33%	61.62%	60.63%	57.42%
2006	46.45%	48.03%	57.11%	61.61%	66.25%	69.89%	69.24%	67.06%	63.42%	65.17%	68.63%	72.40%	74.86%	73.44%	75.23%	65.56%	66.64%	65.42%	65.96%	63.98%	62.64%	63.77%	63.64%	60.09%	61.75%	60.06%	60.25%	58.88%	60.15%	59.60%
2007	56.51%	57.77%	61.56%	67.38%	71.01%	70.63%	67.26%	64.09%	65.54%	69.30%	71.59%	75.36%	75.80%	76.92%	67.59%	68.09%	66.17%	67.36%	65.39%	65.65%	67.08%	65.50%	62.85%	63.20%	62.60%	62.39%	63.71%	63.07%	63.36%	61.85%
2008	58.37%	61.71%	65.40%	69.79%	69.08%	63.87%	60.59%	62.16%	66.31%	71.00%	75.24%	75.92%	76.78%	65.21%	65.38%	67.49%	69.17%	68.41%	66.14%	66.31%	65.02%	64.64%	66.14%	65.22%	64.71%	65.61%	63.42%	64.45%	62.98%	60.77%
2009	66.56%	63.31%	66.22%	65.46%	58.71%	55.15%	57.58%	61.79%	67.60%	72.52%	73.05%	74.59%	64.37%	63.97%	65.92%	67.42%	68.76%	62.50%	63.46%	63.34%	66.89%	60.19%	64.05%	60.11%	60.01%	63.66%	63.79%	62.60%	61.45%	59.04%
2010	66.00%	66.86%	63.44%	55.01%	49.66%	52.25%	58.07%	64.54%	68.15%	69.88%	68.00%	59.92%	61.79%	63.27%	67.35%	65.89%	62.46%	66.39%	60.74%	61.44%	59.46%	59.76%	59.66%	59.59%	59.98%	61.12%	58.28%	60.35%	59.01%	56.98%
2011	68.03%	66.74%	56.13%	45.83%	48.62%	56.56%	61.69%	64.59%	64.82%	63.45%	60.86%	59.80%	60.83%	65.67%	63.15%	65.92%	62.32%	62.85%	60.09%	59.73%	57.74%	57.35%	58.29%	57.37%	56.05%	55.83%	56.27%	56.09%	55.06%	54.51%
2012	46.24%	63.51%	47.30%	49.50%	54.00%	61.12%	65.04%	62.51%	61.88%	59.51%	59.06%	61.46%	64.91%	62.34%	60.11%	59.01%	57.33%	64.01%	55.63%	58.58%	58.18%	61.08%	59.33%	58.97%	59.26%	59.36%	58.50%	59.92%	56.99%	56.35%
2013	60.91%	48.78%	50.70%	55.25%	58.81%	64.25%	64.34%	65.66%	55.32%	58.58%	60.28%	62.71%	62.38%	60.65%	59.15%	58.79%	58.19%	55.73%	56.65%	54.18%	57.95%	58.74%	55.32%	57.68%	56.99%	57.16%	56.55%	55.56%	52.91%	52.36%
2014	32.79%	45.46%	48.67%	53.07%	59.96%	60.23%	62.98%	56.34%	55.86%	59.03%	64.53%	58.86%	59.97%	60.46%	57.75%	58.57%	57.98%	56.61%	56.10%	58.48%	59.04%	55.48%	59.87%	54.25%	57.39%	57.31%	56.92%	57.72%	57.30%	56.78%
2015	23.35%	52.53%	53.20%	58.29%	60.27%	64.24%	57.08%	56.57%	61.70%	62.50%	61.41%	60.58%	59.07%	60.33%	59.59%	57.57%	58.23%	59.54%	57.26%	56.75%	60.30%	57.07%	59.19%	55.85%	57.00%	58.40%	58.18%	55.76%	52.86%	54.13%
2016	49.00%	61.06%	60.72%	62.44%	65.54%	54.86%	56.14%	59.41%	62.55%	63.86%	60.38%	59.43%	60.29%	61.34%	60.45%	58.92%	58.16%	62.96%	58.53%	58.67%	56.99%	56.84%	59.67%	58.78%	58.06%	59.27%	58.99%	58.46%	58.30%	53.51%
2017	42.18%	61.22%	63.39%	65.11%	51.60%	54.27%	57.34%	61.00%	59.68%	59.07%	58.42%	56.74%	57.55%	57.53%	56.45%	58.91%	55.98%	56.82%	55.54%	55.53%	55.26%	55.47%	58.41%	55.87%	55.90%	55.53%	55.15%	56.72%	52.56%	55.83%
2018	46.83%	66.30%	66.48%	51.97%	56.26%	57.38%	60.42%	57.83%	57.65%	58.14%	59.47%	57.62%	57.75%	56.47%	58.23%	56.39%	56.16%	57.51%	55.45%	59.61%	56.29%	57.97%	58.88%	54.08%	55.47%	56.90%	55.19%	55.47%	53.98%	53.40%
2019	67.32%	70.32%	53.34%	58.07%	59.53%	60.28%	61.09%	59.74%	60.12%	58.56%	59.60%	58.03%	57.66%	58.07%	57.67%	57.42%	61.25%	59.33%	57.54%	58.71%	58.23%	60.60%	54.86%	58.81%	58.63%	58.06%	56.09%	58.20%	57.63%	55.88%
2020	0.00%	58.94%	58.34%	61.35%	63.25%	62.62%	62.48%	60.03%	60.20%	60.16%	58.87%	59.79%	60.45%	59.40%	58.68%	57.97%	61.72%	58.73%	58.76%	58.80%	59.01%	57.75%	57.87%	59.94%	59.43%	57.82%	57.21%	59.00%	57.70%	56.84%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Cumulative Loss Rate
All Products Combined

Table 13: Cumulative Gross Claim Cost
Total Gross Losses for each Fiscal Year as of the End of the Evaluation Year

Evaluation Year

Fiscal Year	1	2	3	4	5	6	7	8	9	10
1990	3,073,174	127,928,029	649,755,560	1,443,873,537	2,204,728,260	2,764,369,081	3,157,317,050	3,494,972,946	3,742,030,585	3,916,981,105
1991	2,601,471	109,150,913	561,549,258	1,158,706,591	1,692,720,712	2,107,876,025	2,490,682,241	2,788,151,090	2,995,193,070	3,135,132,891
1992	1,257,151	80,503,073	377,213,837	776,108,566	1,194,855,925	1,656,189,915	2,052,752,970	2,345,792,288	2,544,638,351	2,657,944,610
1993	3,105,635	115,354,404	523,380,234	1,136,110,285	1,961,854,274	2,709,541,160	3,278,087,227	3,655,758,664	3,859,275,591	3,994,351,515
1994	5,342,530	181,675,958	769,077,797	1,769,747,659	2,871,494,999	3,760,576,138	4,345,531,244	4,679,408,255	4,901,766,223	5,059,192,109
1995	2,501,812	95,818,636	559,737,375	1,321,584,196	2,049,876,074	2,555,585,436	2,869,212,926	3,073,134,046	3,248,900,944	3,357,931,945
1996	1,351,909	167,256,815	967,291,340	2,145,269,733	3,096,658,307	3,726,290,690	4,163,446,694	4,526,512,930	4,744,227,829	4,865,213,336
1997	2,312,490	211,832,815	1,082,969,447	2,119,171,950	2,901,482,130	3,522,211,378	4,031,450,457	4,339,029,197	4,518,078,969	4,624,222,810
1998	3,588,997	252,791,228	1,156,365,839	2,122,649,814	2,994,490,176	3,812,329,166	4,342,600,168	4,663,135,688	4,857,300,586	4,986,977,730
1999	3,227,094	276,695,899	1,234,968,743	2,561,791,417	4,040,855,926	5,053,182,774	5,651,178,154	5,993,113,386	6,216,247,002	6,402,764,704
2000	3,753,739	284,412,593	1,410,905,676	3,038,936,178	4,187,992,043	4,835,120,071	5,208,889,940	5,458,307,370	5,663,717,731	5,831,148,905
2001	1,387,781	326,819,244	1,829,345,472	3,527,499,841	4,693,296,480	5,406,804,652	5,875,716,556	6,259,453,117	6,587,292,612	6,941,605,136
2002	2,934,027	406,855,798	1,916,866,639	3,376,972,913	4,393,699,261	5,114,076,322	5,714,488,715	6,246,011,853	6,809,776,432	7,285,935,629
2003	3,052,191	497,452,005	1,640,123,366	2,639,110,025	3,456,173,003	4,238,665,766	4,985,789,425	5,857,350,014	6,592,495,818	7,299,765,948
2004	67,639,436	797,722,610	1,908,967,063	3,097,129,640	4,382,822,378	5,597,009,063	6,916,072,296	7,988,198,725	9,058,337,764	10,156,448,508
2005	26,562,569	357,982,544	1,198,360,715	2,313,449,671	3,542,486,849	4,866,352,686	5,960,786,216	7,008,542,509	8,105,525,582	8,881,951,311
2006	9,997,700	328,033,368	1,338,361,590	2,818,760,735	4,574,920,765	5,924,525,199	7,220,189,030	8,630,227,549	9,592,558,080	10,327,714,447
2007	8,877,186	458,824,448	2,000,756,708	4,212,031,744	5,825,617,238	7,616,644,816	9,960,469,828	11,408,068,382	12,431,907,340	13,275,745,284
2008	20,494,138	1,099,527,169	5,176,394,161	9,141,715,245	13,864,430,692	20,541,767,049	24,770,885,665	27,594,669,136	29,877,609,160	31,162,894,752
2009	34,088,496	1,387,318,903	4,436,556,269	8,885,949,003	16,031,906,630	21,395,644,529	25,173,549,099	28,188,954,749	29,904,676,301	30,872,668,954
2010	18,228,050	468,396,653	1,876,619,449	4,734,425,206	7,572,306,245	9,912,458,158	11,675,648,042	12,737,644,749	13,367,755,579	13,764,469,443
2011	10,512,283	266,239,224	1,134,273,102	2,223,474,779	3,269,577,519	4,116,619,872	4,686,396,108	5,016,051,232	5,236,658,255	5,354,202,013
2012	8,662,792	164,987,330	623,135,587	1,234,239,223	1,883,569,896	2,354,557,222	2,653,242,587	2,869,618,129	2,985,677,070	3,158,353,876
2013	6,722,064	169,730,743	602,546,039	1,199,656,258	1,766,268,721	2,159,961,563	2,453,685,649	2,623,385,995	2,879,615,836	3,166,560,614
2014	834,183	76,226,509	322,426,255	698,932,504	984,753,009	1,214,962,282	1,356,700,878	1,544,896,447	1,706,385,549	1,836,563,313
2015	1,227,990	58,476,442	330,030,569	668,373,204	1,011,936,839	1,241,288,259	1,586,264,308	1,928,048,914	2,198,655,201	2,374,990,296
2016	1,011,785	60,913,371	298,145,629	666,108,736	956,390,191	1,537,129,018	2,073,690,903	2,490,447,727	2,828,572,745	3,052,471,374
2017	1,410,313	59,720,077	320,562,754	634,906,564	1,444,175,793	2,515,215,834	3,352,092,124	3,995,523,853	4,440,993,093	4,815,917,852
2018	1,706,489	69,982,489	286,421,628	1,037,225,537	2,201,402,914	3,253,460,269	4,136,884,706	4,850,479,121	5,409,497,687	5,898,765,289
2019	1,246,515	36,314,747	624,360,536	1,633,867,827	2,698,917,676	3,615,399,777	4,404,639,556	5,011,324,498	5,508,211,463	5,929,801,437
2020	240,882	335,339,477	1,094,116,342	2,171,988,501	3,434,103,730	4,520,129,605	5,540,667,188	6,407,337,255	7,154,786,542	7,795,709,630

Fiscal Year	11	12	13	14	15	16	17	18	19	20
1990	4,036,327,248	4,102,385,582	4,147,281,640	4,182,453,472	4,206,491,304	4,221,376,344	4,232,081,689	4,240,730,648	4,248,549,479	4,254,573,466
1991	3,214,518,587	3,266,972,789	3,303,112,121	3,329,493,788	3,346,405,380	3,357,289,769	3,364,002,755	3,370,826,395	3,376,560,621	3,383,076,705
1992	2,731,368,793	2,779,590,161	2,809,652,545	2,826,762,795	2,839,077,487	2,846,771,629	2,854,149,292	2,861,270,976	2,867,647,924	2,874,846,355
1993	4,085,958,900	4,143,702,987	4,176,080,014	4,196,213,044	4,210,752,608	4,222,797,443	4,233,938,571	4,247,033,319	4,260,754,926	4,270,642,982
1994	5,154,117,975	5,209,099,526	5,243,505,408	5,267,034,529	5,285,700,548	5,304,967,685	5,330,540,517	5,350,578,947	5,366,874,160	5,388,803,481
1995	3,416,316,618	3,453,059,064	3,477,110,237	3,497,193,452	3,517,223,718	3,539,586,004	3,558,802,488	3,573,460,461	3,589,675,490	3,601,248,377
1996	4,940,079,764	4,987,984,565	5,030,528,208	5,068,907,063	5,113,286,102	5,148,694,786	5,181,611,598	5,215,504,188	5,238,856,048	5,265,911,592
1997	4,693,436,921	4,753,007,605	4,803,405,233	4,861,271,864	4,907,990,637	4,948,128,386	4,991,802,917	5,025,052,403	5,059,301,808	5,094,328,980
1998	5,095,003,612	5,194,403,104	5,302,202,655	5,396,417,319	5,479,927,445	5,566,615,516	5,630,613,819	5,696,159,041	5,762,482,666	5,796,514,522
1999	6,573,539,915	6,753,457,750	6,921,417,243	7,065,298,639	7,209,018,738	7,307,386,918	7,405,854,629	7,501,239,317	7,554,408,573	7,592,101,288
2000	6,007,180,235	6,146,574,349	6,262,905,281	6,382,113,864	6,465,905,549	6,548,044,086	6,624,419,205	6,672,424,171	6,708,260,824	6,726,873,965
2001	7,250,495,114	7,501,872,644	7,747,137,771	7,908,745,933	8,067,919,962	8,202,223,070	8,284,450,152	8,333,441,740	8,361,003,186	8,376,982,387
2002	7,711,671,276	8,136,960,003	8,412,811,087	8,662,370,200	8,882,708,865	9,002,691,916	9,074,532,104	9,117,589,522	9,138,653,900	9,160,459,172
2003	8,029,775,278	8,527,299,399	8,914,779,624	9,231,816,859	9,398,917,523	9,491,631,841	9,542,587,561	9,567,196,102	9,600,035,252	9,627,302,156
2004	10,920,626,528	11,521,195,059	12,006,755,696	12,255,042,357	12,397,701,835	12,471,128,879	12,511,410,095	12,559,911,662	12,600,331,609	12,633,651,246
2005	9,491,759,372	9,962,569,146	10,212,204,800	10,348,110,874	10,428,892,317	10,466,466,396	10,513,464,032	10,549,200,733	10,576,757,363	10,600,592,534
2006	10,920,594,194	11,244,798,362	11,445,307,556	11,553,122,656	11,609,451,778	11,662,176,933	11,703,400,276	11,735,433,995	11,765,077,502	11,788,217,343
2007	13,771,170,940	14,044,811,365	14,211,749,405	14,302,967,678	14,369,342,081	14,436,017,761	14,487,375,342	14,527,061,706	14,559,191,113	14,585,964,853
2008	31,867,916,485	32,300,894,526	32,537,638,765	32,735,419,572	32,907,491,329	33,032,384,339	33,133,087,247	33,210,169,238	33,277,940,539	33,335,113,488
2009	31,451,097,291	31,761,181,683	32,048,283,167	32,283,533,744	32,456,615,790	32,603,387,503	32,709,708,624	32,804,041,659	32,874,663,729	32,934,119,578
2010	13,971,046,865	14,211,902,586	14,419,582,860	14,555,666,649	14,658,256,412	14,738,865,208	14,816,544,065	14,894,456,694	14,945,782,486	14,983,069,276
2011	5,531,585,419	5,670,255,088	5,772,048,288	5,849,228,144	5,914,373,973	5,978,268,413	6,035,623,559	6,069,855,535	6,099,198,854	6,124,274,816
2012	3,317,125,085	3,430,422,353	3,504,060,464	3,566,917,936	3,631,113,623	3,683,894,864	3,727,256,789	3,772,128,715	3,807,313,984	3,833,448,926
2013	3,347,194,792	3,499,176,815	3,633,293,087	3,762,233,076	3,881,926,159	3,989,463,405	4,078,540,552	4,161,356,416	4,225,820,896	4,286,926,954
2014	1,941,503,173	2,013,378,959	2,077,927,767	2,130,195,996	2,172,462,815	2,210,556,905	2,244,483,591	2,272,866,591	2,296,684,313	2,313,370,573
2015	2,496,444,078	2,596,747,375	2,684,766,730	2,759,703,801	2,822,058,476	2,877,637,482	2,922,218,293	2,957,169,974	2,992,346,181	3,016,988,965
2016	3,234,741,267	3,391,184,459	3,514,923,501	3,637,749,660	3,727,934,452	3,807,405,965	3,873,503,859	3,934,705,296	3,976,384,363	4,012,737,007
2017	5,112,397,150	5,348,887,933	5,543,671,568	5,702,298,560	5,834,717,647	5,949,174,741	6,032,524,290	6,103,540,859	6,162,727,675	6,214,466,643
2018	6,270,859,554	6,554,145,438	6,779,833,054	6,956,742,890	7,108,164,407	7,225,235,371	7,320,594,614	7,393,919,583	7,458,981,400	7,529,453,554
2019	6,274,008,215	6,547,861,496	6,744,068,713	6,902,314,436	7,041,057,483	7,153,133,821	7,254,129,511	7,331,116,607	7,400,297,935	7,450,347,662
2020	8,351,962,190	8,836,445,004	9,275,651,072	9,593,346,236	9,857,764,184	10,099,780,838	10,328,626,933	10,503,164,732	10,643,839,257	10,766,133,248

Fiscal Year	21	22	23	24	25	26	27	28	29	30
1990	4,262,317,933	4,269,310,758	4,273,926,809	4,279,455,792	4,282,364,365	4,285,582,236	4,289,572,984	4,291,311,916	4,292,855,159	4,293,957,341
1991	3,389,668,098	3,395,164,304	3,401,014,559	3,404,540,712	3,408,650,234	3,413,424,132	3,415,879,417	3,417,434,294	3,419,080,185	3,419,587,594
1992	2,880,555,477	2,887,225,009	2,891,207,419	2,896,114,674	2,901,320,086	2,904,912,715	2,906,767,179	2,908,036,741	2,908,535,340	2,908,727,255
1993	4,284,188,296	4,293,009,518	4,304,528,993	4,315,351,667	4,322,721,779	4,326,158,788	4,328,195,602	4,329,327,329	4,330,454,370	4,331,567,320
1994	5,404,272,689	5,418,487,594	5,434,224,612	5,443,616,658	5,449,822,845	5,453,105,148	5,454,667,726	5,456,543,407	5,458,158,398	5,459,670,910
1995	3,614,866,776	3,630,732,184	3,639,275,591	3,645,516,184	3,649,691,094	3,650,812,173	3,652,345,362	3,653,537,658	3,654,666,209	3,655,424,393
1996	5,294,439,230	5,311,720,390	5,322,396,168	5,329,802,847	5,332,886,417	5,336,245,098	5,338,390,735	5,340,579,445	5,342,541,760	5,343,729,828
1997	5,116,308,347	5,129,728,595	5,137,023,854	5,141,934,371	5,146,752,718	5,151,123,436	5,154,570,614	5,156,651,855	5,159,118,704	5,161,211,243
1998	5,817,581,898	5,828,294,529	5,835,699,061	5,841,220,156	5,848,025,723	5,854,023,624	5,858,760,804	5,863,130,578	5,866,328,073	5,868,870,056
1999	7,611,984,678	7,622,486,912	7,633,062,726	7,643,751,474	7,654,893,164	7,662,641,043	7,669,406,633	7,675,589,544	7,679,577,446	7,682,226,692
2000	6,737,722,911	6,745,297,213	6,754,130,616	6,761,771,585	6,768,767,304	6,774,477,513	6,779,360,403	6,783,700,079	6,786,390,068	6,788,599,345
2001	8,390,770,987	8,406,002,754	8,418,686,259	8,428,050,535	8,437,050,541	8,444,704,154	8,450,934,667	8,456,434,094	8,460,143,116	8,462,920,073
2002	9,182,594,474	9,199,550,615	9,212,247,741	9,222,595,202	9,231,727,486	9,238,384,009	9,245,201,783	9,250,655,755	9,256,117,512	9,258,917,416
2003	9,651,123,683	9,669,462,612	9,682,299,223	9,695,786,569	9,706,677,621	9,717,309,188	9,726,746,032	9,733,944,603	9,740,905,594	9,744,675,292
2004	12,661,579,802	12,683,546,992	12,702,953,952	12,719,303,253	12,734,960,039	12,748,685,447	12,760,170,585	12,769,498,781	12,776,796,119	12,782,101,840
2005	10,617,556,356	10,633,788,677	10,647,523,345	10,660,379,982	10,672,732,646	10,683,272,562	10,692,268,224	10,699,104,567	10,704,974,292	10,708,211,755
2006	11,807,725,072	11,823,529,998	11,835,591,562	11,848,009,062	11,860,412,446	11,869,130,089	11,876,452,391	11,883,469,559	11,887,573,395	11,892,229,970
2007	14,607,160,332	14,625,936,567	14,642,312,261	14,658,434,662	14,673,013,656	14,686,951,312	14,695,776,537	14,704,416,503	14,710,264,397	14,714,301,725
2008	33,382,467,289	33,418,196,236	33,454,248,832	33,483,140,905	33,509,927,858	33,532,745,244	33,552,729,122	33,568,261,988	33,581,307,279	33,590,742,485
2009	32,989,747,628	33,029,351,428	33,062,257,069	33,087,010,630	33,112,463,059	33,132,523,075	33,150,238,950	33,164,577,318	33,176,148,349	33,183,591,489
2010	15,019,386,520	15,048,146,424	15,075,313,647	15,097,769,447	15,118,481,420	15,135,275,510	15,149,112,949	15,160,054,492	15,169,475,176	15,175,947,500
2011	6,145,891,429	6,165,075,099	6,181,742,159	6,194,549,880	6,210,403,288	6,220,244,981	6,229,545,796	6,238,109,607	6,244,077,042	6,248,194,815
2012	3,855,354,901	3,871,607,369	3,888,762,985	3,901,696,156	3,914,601,053	3,925,529,038	3,935,648,032	3,943,609,086	3,949,666,557	3,953,411,725
2013	4,331,881,524	4,365,654,022	4,398,049,955	4,428,661,241	4,454,350,886	4,476,268,477	4,494,877,752	4,509,758,785	4,524,058,336	4,532,641,343
2014	2,331,076,264	2,343,514,346	2,353,403,152	2,365,533,819	2,375,792,677	2,383,590,341	2,389,068,939	2,394,718,150	2,399,085,259	2,402,087,889
2015	3,037,647,596	3,056,343,533	3,069,038,340	3,083,534,447	3,095,707,451	3,106,228,444	3,113,369,420	3,120,501,790	3,126,957,598	3,131,156,104
2016	4,038,812,725	4,063,474,399	4,083,373,159	4,100,028,548	4,116,372,132	4,131,027,785	4,142,754,279	4,152,661,875	4,160,925,012	4,167,657,130
2017	6,254,032,675	6,288,531,984	6,315,683,855	6,342,633,274	6,365,370,461	6,389,998,959	6,409,153,690	6,421,466,342	6,433,707,238	6,440,539,239
2018	7,576,751,178	7,614,791,256	7,645,774,580	7,676,758,348	7,705,324,598	7,729,134,190	7,751,008,006	7,771,776,177	7,786,206,944	7,795,281,643
2019	7,500,293,546	7,534,706,283	7,567,044,178	7,595,317,679	7,621,745,730	7,641,942,687	7,660,395,969	7,676,230,417	7,690,773,923	7,700,168,557
2020	10,857,649,843	10,935,637,964	11,001,652,798	11,061,788,886	11,110,787,889	11,151,077,600	11,188,939,615	11,218,706,733	11,239,010,364	11,253,066,919

Table 14: Cumulative Claim Cost Net of Recovery
Total Losses Net of Recovery for each Fiscal Year as of the End of the Evaluation Year

Evaluation Year

Fiscal Year	1	2	3	4	5	6	7	8	9	10
1990	2,480,479	69,745,338	327,992,377	722,118,435	1,111,439,556	1,403,564,868	1,615,080,704	1,785,358,965	1,896,455,588	1,975,188,246
1991	1,005,047	56,311,706	287,794,144	596,817,631	881,586,329	1,108,064,406	1,302,688,249	1,438,303,542	1,530,343,416	1,586,075,204
1992	521,537	43,117,780	203,918,612	417,584,090	646,094,454	875,694,133	1,046,184,236	1,169,850,160	1,246,560,444	1,284,053,272
1993	1,102,429	63,100,798	290,096,570	619,455,292	1,016,385,493	1,326,647,864	1,546,978,356	1,680,342,367	1,739,312,545	1,775,968,053
1994	2,844,572	105,872,427	439,266,111	920,954,922	1,353,993,958	1,682,960,724	1,876,154,696	1,970,252,762	2,027,493,785	2,070,512,315
1995	1,209,908	56,478,055	270,191,628	562,308,841	830,632,135	1,008,513,808	1,104,497,306	1,163,350,089	1,218,393,045	1,252,239,828
1996	577,846	68,236,703	369,855,846	796,701,609	1,115,553,331	1,304,318,387	1,427,277,445	1,538,660,587	1,606,567,299	1,648,690,498
1997	773,629	85,870,008	420,633,186	773,436,160	1,010,445,327	1,188,773,845	1,344,477,052	1,439,736,155	1,501,405,614	1,542,084,954
1998	1,405,795	102,282,603	414,002,140	701,193,685	941,965,111	1,187,703,774	1,347,062,127	1,452,954,700	1,527,808,313	1,593,778,677
1999	1,235,574	103,808,889	412,527,595	789,976,377	1,233,932,303	1,545,357,862	1,756,237,700	1,884,891,733	1,993,787,026	2,103,468,038
2000	1,306,399	99,768,383	453,422,800	1,000,485,699	1,388,189,788	1,626,589,273	1,780,141,794	1,903,961,426	2,027,921,073	2,130,488,542
2001	427,509	108,631,321	646,976,396	1,246,600,801	1,681,837,448	1,969,977,691	2,200,062,241	2,426,090,808	2,625,399,673	2,852,661,421
2002	998,154	149,893,337	721,821,018	1,295,981,975	1,703,898,383	2,047,872,638	2,380,770,773	2,694,154,168	3,051,020,860	3,365,326,730
2003	1,299,438	219,475,155	701,405,512	1,103,086,712	1,479,224,908	1,903,599,171	2,328,805,722	2,864,783,178	3,334,106,655	3,787,548,490
2004	30,974,357	354,661,488	810,319,354	1,362,439,301	2,063,876,024	2,773,082,590	3,590,325,470	4,296,168,272	4,995,892,694	5,676,173,386
2005	10,396,998	147,076,386	546,788,017	1,166,962,437	1,896,118,341	2,744,531,179	3,475,382,833	4,179,526,435	4,886,846,976	5,354,794,847
2006	4,643,483	157,408,180	734,399,717	1,646,431,553	2,809,939,283	3,753,195,982	4,650,283,007	5,595,819,443	6,206,170,753	6,685,248,373
2007	5,016,624	264,935,651	1,214,087,516	2,703,946,822	3,849,683,973	5,114,659,372	6,691,060,516	7,618,787,655	8,289,851,577	8,874,652,738
2008	11,963,289	677,840,675	3,344,137,266	6,111,468,844	9,373,977,555	13,638,870,162	16,201,435,586	17,956,826,143	19,470,703,495	20,383,234,087
2009	22,688,337	879,460,324	2,898,761,155	5,811,392,043	10,006,486,729	12,964,781,284	15,140,190,853	17,003,557,079	18,163,406,068	18,865,406,118
2010	12,030,829	313,005,975	1,206,324,312	2,778,496,500	4,187,897,679	5,410,587,164	6,434,430,864	7,119,823,239	7,549,271,660	7,826,500,545
2011	7,151,361	177,825,413	665,024,641	1,164,159,298	1,672,748,989	2,151,801,979	2,503,280,951	2,716,202,565	2,859,195,796	2,933,771,597
2012	4,005,653	103,280,838	319,986,655	622,500,498	973,141,773	1,261,014,622	1,455,271,378	1,590,530,990	1,662,344,890	1,765,097,183
2013	4,094,555	83,609,208	303,058,561	632,970,386	966,218,839	1,219,152,909	1,408,131,016	1,519,549,220	1,661,292,333	1,829,388,890
2014	273,515	34,548,175	154,361,789	354,157,317	525,544,770	664,192,314	753,465,917	859,496,445	949,698,484	1,026,547,437
2015	286,781	30,357,629	174,832,200	372,053,541	579,115,794	726,444,332	923,350,625	1,116,710,499	1,283,686,169	1,393,892,406
2016	495,821	37,071,289	181,120,182	410,883,570	601,143,699	919,750,141	1,221,000,579	1,468,579,333	1,680,079,726	1,823,058,246
2017	594,813	36,293,844	201,654,150	406,315,212	823,933,827	1,405,134,187	1,884,964,631	2,277,434,686	2,543,276,142	2,764,758,997
2018	799,188	46,065,248	189,953,851	580,137,597	1,235,107,364	1,838,807,841	2,372,611,090	2,785,295,715	3,107,588,002	3,392,038,873
2019	839,177	25,499,469	339,137,351	925,310,496	1,559,376,233	2,111,819,076	2,593,979,724	2,956,397,308	3,255,139,068	3,502,020,017
2020	0	197,503,111	640,169,116	1,301,396,980	2,099,721,624	2,779,832,651	3,417,513,742	3,937,803,482	4,387,772,322	4,773,327,738

Fiscal Year	11	12	13	14	15	16	17	18	19	20
1990	2,025,741,062	2,051,797,136	2,070,267,492	2,084,198,763	2,093,662,757	2,100,588,504	2,106,124,437	2,111,432,237	2,117,183,999	2,121,204,892
1991	1,616,232,033	1,634,736,293	1,646,837,030	1,656,512,660	1,663,190,535	1,668,474,632	1,672,794,545	1,677,874,182	1,681,659,373	1,686,034,848
1992	1,305,231,500	1,318,850,376	1,328,501,047	1,335,551,599	1,340,846,948	1,345,006,636	1,349,875,718	1,354,104,959	1,358,341,938	1,363,208,390
1993	1,801,889,532	1,819,441,587	1,831,081,978	1,840,101,320	1,847,596,809	1,855,042,328	1,861,890,372	1,869,900,992	1,878,381,311	1,884,117,779
1994	2,096,883,721	2,117,604,056	2,131,237,256	2,143,342,646	2,154,975,228	2,165,562,626	2,181,364,188	2,193,774,240	2,203,755,836	2,216,069,966
1995	1,272,918,929	1,287,019,310	1,300,473,957	1,312,824,643	1,324,966,453	1,339,368,145	1,351,741,864	1,360,867,784	1,369,903,814	1,376,248,472
1996	1,678,995,041	1,702,944,201	1,728,355,900	1,752,408,338	1,780,540,106	1,804,264,923	1,825,276,792	1,844,168,424	1,856,731,872	1,872,360,944
1997	1,576,544,838	1,612,413,270	1,642,891,497	1,680,205,689	1,710,644,782	1,735,750,891	1,762,604,799	1,780,179,388	1,799,511,846	1,820,227,713
1998	1,657,506,966	1,718,067,688	1,786,899,259	1,849,098,767	1,903,958,256	1,956,609,826	1,991,501,535	2,028,531,890	2,071,066,178	2,093,758,983
1999	2,203,748,745	2,315,608,095	2,428,112,234	2,520,865,940	2,608,107,202	2,664,548,112	2,721,838,759	2,780,184,673	2,815,058,941	2,839,672,429
2000	2,246,234,652	2,342,892,298	2,422,496,129	2,496,683,561	2,546,021,148	2,598,482,058	2,648,944,880	2,681,237,000	2,704,929,636	2,716,492,524
2001	3,062,781,813	3,230,775,573	3,384,865,732	3,482,106,132	3,580,717,468	3,668,671,093	3,723,592,855	3,756,942,032	3,775,483,601	3,786,784,444
2002	3,646,628,015	3,908,001,719	4,069,736,782	4,224,241,526	4,364,698,958	4,446,591,575	4,494,926,122	4,523,514,309	4,536,805,100	4,549,372,268
2003	4,229,898,799	4,509,635,956	4,732,775,023	4,926,581,298	5,038,177,163	5,103,694,170	5,138,801,326	5,154,545,156	5,173,639,649	5,189,860,832
2004	6,105,875,106	6,463,643,988	6,766,729,776	6,936,264,239	7,033,595,876	7,085,412,508	7,112,545,984	7,142,236,958	7,166,793,154	7,186,179,713
2005	5,730,403,090	6,038,684,251	6,216,231,372	6,314,116,067	6,372,621,264	6,398,043,834	6,427,472,291	6,449,531,717	6,467,318,812	6,483,398,163
2006	7,092,160,998	7,326,891,472	7,477,000,181	7,556,178,703	7,598,557,039	7,633,121,444	7,660,593,238	7,681,549,483	7,701,101,437	7,715,906,643
2007	9,229,347,896	9,435,554,031	9,562,098,343	9,632,263,647	9,677,126,634	9,722,526,353	9,756,508,833	9,783,242,054	9,804,252,564	9,821,829,304
2008	20,913,721,333	21,242,448,866	21,424,222,490	21,553,193,814	21,665,691,884	21,749,976,837	21,819,633,801	21,872,363,974	21,917,186,818	21,955,098,708
2009	19,287,934,799	19,519,225,757	19,704,047,303	19,854,542,928	19,968,641,749	20,067,593,010	20,140,699,156	20,199,653,043	20,244,469,969	20,282,127,591
2010	7,966,968,822	8,111,297,353	8,239,622,102	8,325,715,634	8,394,805,958	8,447,917,650	8,496,435,237	8,548,163,238	8,579,338,423	8,602,247,689
2011	3,041,732,266	3,124,649,803	3,186,575,383	3,237,259,765	3,278,400,741	3,320,517,285	3,356,263,612	3,377,776,979	3,395,409,442	3,410,387,571
2012	1,858,862,889	1,928,496,304	1,976,295,717	2,015,481,010	2,054,066,454	2,085,214,422	2,110,072,894	2,138,793,548	2,158,365,810	2,173,675,257
2013	1,938,278,649	2,033,589,791	2,117,251,927	2,195,450,459	2,266,247,909	2,329,464,849	2,381,301,222	2,427,450,415	2,463,969,954	2,497,075,583
2014	1,094,264,107	1,136,571,714	1,175,284,692	1,206,888,257	1,231,296,207	1,253,609,595	1,273,279,200	1,289,345,664	1,302,706,399	1,312,464,977
2015	1,468,482,350	1,529,242,488	1,581,238,068	1,626,445,442	1,663,603,043	1,695,599,183	1,721,559,832	1,742,370,083	1,762,512,267	1,776,496,649
2016	1,933,110,905	2,026,080,041	2,100,678,827	2,176,024,312	2,230,540,243	2,277,362,825	2,315,803,345	2,354,333,660	2,378,727,396	2,400,053,718
2017	2,937,963,621	3,072,153,845	3,184,250,395	3,275,509,174	3,350,254,979	3,417,686,305	3,464,349,087	3,504,703,070	3,537,573,069	3,566,301,451
2018	3,613,333,314	3,776,572,704	3,906,905,349	4,006,803,259	4,094,982,939	4,161,000,610	4,214,556,043	4,256,725,237	4,292,804,673	4,334,815,778
2019	3,707,168,020	3,866,086,855	3,979,213,134	4,071,109,271	4,151,125,038	4,215,479,603	4,277,341,054	4,323,018,273	4,362,824,850	4,392,208,389
2020	5,100,814,761	5,390,463,184	5,655,977,906	5,844,677,162	5,999,840,333	6,140,125,693	6,281,377,041	6,383,885,042	6,466,550,556	6,538,453,496

Fiscal Year	21	22	23	24	25	26	27	28	29	30
1990	2,126,739,793	2,131,751,218	2,134,845,381	2,138,052,889	2,139,566,214	2,141,559,603	2,143,958,060	2,144,712,209	2,145,502,743	2,145,972,849
1991	1,690,420,286	1,693,883,117	1,697,220,436	1,699,178,951	1,701,580,410	1,704,075,754	1,705,412,853	1,706,278,775	1,707,080,181	1,707,384,068
1992	1,366,414,443	1,370,123,877	1,372,046,322	1,374,282,155	1,376,917,388	1,378,837,192	1,379,517,772	1,379,901,357	1,380,092,998	1,380,208,718
1993	1,890,864,018	1,894,712,340	1,900,179,642	1,906,138,158	1,910,005,936	1,911,800,405	1,912,812,526	1,913,601,134	1,914,250,645	1,914,860,670
1994	2,222,872,264	2,230,337,608	2,239,280,841	2,244,082,701	2,246,370,956	2,248,424,373	2,249,309,705	2,250,397,704	2,251,371,593	2,252,235,281
1995	1,384,166,083	1,392,705,059	1,396,938,356	1,399,950,571	1,402,242,551	1,402,959,173	1,403,852,227	1,404,562,767	1,405,276,628	1,405,739,369
1996	1,889,388,997	1,899,366,239	1,905,365,248	1,909,730,593	1,911,357,207	1,913,286,424	1,914,630,467	1,915,956,089	1,917,225,819	1,917,967,829
1997	1,833,484,080	1,840,866,935	1,844,915,566	1,847,746,338	1,850,677,489	1,853,374,361	1,855,609,242	1,857,019,594	1,858,605,405	1,859,875,914
1998	2,106,162,700	2,112,648,846	2,117,221,757	2,120,672,348	2,125,182,660	2,128,866,396	2,131,980,134	2,134,610,092	2,136,483,856	2,137,876,837
1999	2,852,335,362	2,859,753,733	2,866,325,236	2,872,866,944	2,879,797,489	2,884,526,701	2,888,625,824	2,892,108,562	2,894,325,807	2,895,810,465
2000	2,724,035,025	2,728,733,849	2,734,228,282	2,739,077,972	2,743,953,773	2,747,540,446	2,750,687,299	2,753,119,946	2,754,682,382	2,755,933,922
2001	3,795,165,801	3,804,241,967	3,812,487,823	3,818,445,823	3,823,705,073	3,828,406,187	3,831,980,968	3,835,303,742	3,837,438,026	3,838,914,495
2002	4,561,946,630	4,572,280,246	4,579,984,436	4,586,133,559	4,591,582,214	4,595,421,718	4,599,281,669	4,602,405,046	4,605,454,344	4,607,047,192
2003	5,203,580,185	5,215,913,268	5,224,049,628	5,232,324,868	5,238,851,165	5,245,022,120	5,250,241,269	5,254,395,330	5,258,078,625	5,260,142,029
2004	7,203,866,616	7,217,693,132	7,229,185,480	7,239,106,321	7,248,087,357	7,256,069,716	7,262,436,761	7,267,832,313	7,272,005,692	7,274,853,838
2005	6,494,816,025	6,505,564,089	6,514,107,439	6,522,344,737	6,529,895,651	6,536,131,525	6,541,558,544	6,545,771,219	6,549,330,268	6,551,189,248
2006	7,728,126,162	7,738,204,888	7,745,881,286	7,753,342,389	7,761,001,564	7,766,237,091	7,770,648,973	7,774,781,005	7,777,249,405	7,780,024,645
2007	9,836,046,436	9,848,344,042	9,858,636,150	9,868,825,521	9,877,952,517	9,886,648,363	9,892,270,986	9,897,720,234	9,901,425,389	9,903,922,518
2008	21,985,886,164	22,008,981,815	22,032,827,561	22,051,669,848	22,069,004,671	22,083,974,057	22,096,646,973	22,106,658,332	22,114,874,469	22,120,608,410
2009	20,319,336,330	20,343,173,524	20,364,249,699	20,379,128,687	20,394,402,970	20,407,173,288	20,418,474,130	20,427,449,913	20,434,559,989	20,438,954,375
2010	8,623,843,140	8,641,031,309	8,657,238,584	8,670,620,859	8,683,043,022	8,693,307,924	8,701,372,595	8,707,976,167	8,713,535,489	8,717,223,407
2011	3,422,869,122	3,433,870,706	3,443,585,247	3,450,933,499	3,459,819,223	3,465,314,111	3,470,548,041	3,475,351,503	3,478,636,914	3,480,881,597
2012	2,186,419,630	2,196,347,186	2,206,525,485	2,214,151,883	2,221,799,356	2,228,285,988	2,234,205,732	2,238,976,034	2,242,428,271	2,244,538,719
2013	2,523,126,895	2,542,966,173	2,560,888,857	2,578,546,891	2,593,188,339	2,605,716,838	2,616,239,974	2,624,507,365	2,632,072,597	2,636,566,710
2014	1,322,918,959	1,329,818,990	1,335,739,667	1,342,320,053	1,348,207,864	1,352,676,887	1,355,795,303	1,359,056,021	1,361,558,541	1,363,263,504
2015	1,788,953,585	1,799,624,107	1,807,137,677	1,815,233,607	1,822,171,957	1,828,316,234	1,832,470,603	1,836,447,521	1,839,860,130	1,842,132,765
2016	2,414,914,286	2,428,933,038	2,440,807,254	2,450,597,698	2,460,086,259	2,468,771,989	2,475,688,925	2,481,481,076	2,486,298,480	2,489,900,523
2017	3,588,167,159	3,607,302,385	3,623,160,665	3,638,218,033	3,650,927,909	3,664,605,291	3,675,168,850	3,682,152,079	3,688,585,729	3,692,399,941
2018	4,361,439,207	4,383,492,292	4,401,735,023	4,418,492,450	4,434,337,681	4,447,885,107	4,459,958,328	4,471,478,455	4,479,268,417	4,484,114,094
2019	4,421,292,618	4,442,146,942	4,459,887,139	4,476,515,354	4,492,010,615	4,503,736,089	4,514,087,391	4,523,302,891	4,531,684,546	4,536,934,628
2020	6,592,460,073	6,637,496,157	6,675,698,424	6,711,742,923	6,740,863,262	6,764,158,873	6,785,820,879	6,803,383,318	6,815,099,273	6,823,089,539

Table 15: Cumulative Loss Severity = Table 14/Table 13
Loss Severity for Each Evaluation Year

Evaluation Year

Fiscal Year	1	2	3	4	5	6	7	8	9	10
1990	80.71%	54.52%	50.48%	50.01%	50.41%	50.77%	51.15%	51.08%	50.68%	50.43%
1991	38.63%	51.59%	51.25%	51.51%	52.08%	52.57%	52.30%	51.59%	51.09%	50.59%
1992	41.49%	53.56%	54.06%	53.80%	54.07%	52.87%	50.96%	49.87%	48.99%	48.31%
1993	35.50%	54.70%	55.43%	54.52%	51.81%	48.96%	47.19%	45.96%	45.07%	44.46%
1994	53.24%	58.28%	57.12%	52.04%	47.15%	44.75%	43.17%	42.10%	41.36%	40.93%
1995	48.36%	58.94%	48.27%	42.55%	40.52%	39.46%	38.49%	37.86%	37.50%	37.29%
1996	42.74%	40.80%	38.24%	37.14%	36.02%	35.00%	34.28%	33.99%	33.86%	33.89%
1997	33.45%	40.54%	38.84%	36.50%	34.83%	33.75%	33.35%	33.18%	33.23%	33.35%
1998	39.17%	40.46%	35.80%	33.03%	31.46%	31.15%	31.02%	31.16%	31.45%	31.96%
1999	38.29%	37.52%	33.40%	30.84%	30.54%	30.58%	31.08%	31.45%	32.07%	32.85%
2000	34.80%	35.08%	32.14%	32.92%	33.15%	33.64%	34.18%	34.88%	35.81%	36.54%
2001	30.81%	33.24%	35.37%	35.34%	35.83%	36.44%	37.44%	38.76%	39.86%	41.10%
2002	34.02%	36.84%	37.66%	38.38%	38.78%	40.04%	41.66%	43.13%	44.80%	46.19%
2003	42.57%	44.12%	42.77%	41.80%	42.80%	44.91%	46.71%	48.91%	50.57%	51.89%
2004	45.79%	44.46%	42.45%	43.99%	47.09%	49.55%	51.91%	53.78%	55.15%	55.89%
2005	39.14%	41.08%	45.63%	50.44%	53.53%	56.40%	58.30%	59.63%	60.29%	60.29%
2006	46.45%	47.99%	54.87%	58.41%	61.42%	63.35%	64.41%	64.84%	64.70%	64.73%
2007	56.51%	57.74%	60.68%	64.20%	66.08%	67.15%	67.18%	66.78%	66.68%	66.85%
2008	58.37%	61.65%	64.60%	66.85%	67.61%	66.40%	65.41%	65.07%	65.17%	65.41%
2009	66.56%	63.39%	65.34%	65.40%	62.42%	60.60%	60.14%	60.32%	60.74%	61.11%
2010	66.00%	66.82%	64.28%	58.69%	55.31%	54.58%	55.11%	55.90%	56.47%	56.86%
2011	68.03%	66.79%	58.63%	52.36%	51.16%	52.27%	53.42%	54.15%	54.60%	54.79%
2012	46.24%	62.60%	51.35%	50.44%	51.66%	53.56%	54.85%	55.43%	55.68%	55.89%
2013	60.91%	49.26%	50.30%	52.76%	54.70%	56.44%	57.39%	57.92%	57.69%	57.77%
2014	32.79%	45.32%	47.88%	50.67%	53.37%	54.67%	55.54%	55.63%	55.66%	55.90%
2015	23.35%	51.91%	52.97%	55.67%	57.23%	58.52%	58.21%	57.92%	58.39%	58.69%
2016	49.00%	60.86%	60.75%	61.68%	62.86%	59.84%	58.88%	58.97%	59.40%	59.72%
2017	42.18%	60.77%	62.91%	64.00%	57.05%	55.87%	56.23%	57.00%	57.27%	57.41%
2018	46.83%	65.82%	66.32%	55.93%	56.11%	56.52%	57.35%	57.42%	57.45%	57.50%
2019	67.32%	70.22%	54.32%	56.63%	57.78%	58.41%	58.89%	58.99%	59.10%	59.06%
2020	0.00%	58.90%	58.51%	59.92%	61.14%	61.50%	61.68%	61.46%	61.33%	61.23%

Fiscal Year	11	12	13	14	15	16	17	18	19	20
1990	50.19%	50.01%	49.92%	49.83%	49.77%	49.76%	49.77%	49.79%	49.83%	49.86%
1991	50.28%	50.04%	49.86%	49.75%	49.70%	49.70%	49.73%	49.78%	49.80%	49.84%
1992	47.79%	47.45%	47.28%	47.25%	47.23%	47.25%	47.30%	47.33%	47.37%	47.42%
1993	44.10%	43.91%	43.85%	43.85%	43.88%	43.93%	43.98%	44.03%	44.09%	44.12%
1994	40.68%	40.65%	40.65%	40.69%	40.77%	40.82%	40.92%	41.00%	41.06%	41.12%
1995	37.26%	37.27%	37.40%	37.54%	37.67%	37.84%	37.98%	38.08%	38.16%	38.22%
1996	33.99%	34.14%	34.36%	34.57%	34.82%	35.04%	35.23%	35.36%	35.44%	35.56%
1997	33.59%	33.92%	34.20%	34.56%	34.85%	35.08%	35.31%	35.43%	35.57%	35.73%
1998	32.53%	33.08%	33.70%	34.27%	34.74%	35.15%	35.37%	35.61%	35.94%	36.12%
1999	33.52%	34.29%	35.08%	35.68%	36.18%	36.46%	36.75%	37.06%	37.26%	37.40%
2000	37.39%	38.12%	38.68%	39.12%	39.38%	39.68%	39.99%	40.18%	40.32%	40.38%
2001	42.24%	43.07%	43.69%	44.03%	44.38%	44.73%	44.95%	45.08%	45.16%	45.20%
2002	47.29%	48.03%	48.38%	48.77%	49.14%	49.39%	49.53%	49.61%	49.64%	49.66%
2003	52.68%	52.88%	53.09%	53.37%	53.60%	53.77%	53.85%	53.88%	53.89%	53.91%
2004	55.91%	56.10%	56.36%	56.60%	56.73%	56.81%	56.85%	56.87%	56.88%	56.88%
2005	60.37%	60.61%	60.87%	61.02%	61.11%	61.13%	61.14%	61.14%	61.15%	61.16%
2006	64.94%	65.16%	65.33%	65.40%	65.45%	65.45%	65.46%	65.46%	65.46%	65.45%
2007	67.02%	67.18%	67.28%	67.34%	67.35%	67.35%	67.34%	67.34%	67.34%	67.34%
2008	65.63%	65.76%	65.84%	65.84%	65.84%	65.84%	65.85%	65.86%	65.86%	65.86%
2009	61.33%	61.46%	61.48%	61.50%	61.52%	61.55%	61.57%	61.58%	61.58%	61.58%
2010	57.02%	57.07%	57.14%	57.20%	57.27%	57.32%	57.34%	57.39%	57.40%	57.41%
2011	54.99%	55.11%	55.21%	55.35%	55.43%	55.54%	55.61%	55.65%	55.67%	55.69%
2012	56.04%	56.22%	56.40%	56.50%	56.57%	56.60%	56.61%	56.70%	56.69%	56.70%
2013	57.91%	58.12%	58.27%	58.35%	58.38%	58.39%	58.39%	58.33%	58.31%	58.25%
2014	56.36%	56.45%	56.56%	56.66%	56.68%	56.71%	56.73%	56.73%	56.72%	56.73%
2015	58.82%	58.89%	58.90%	58.94%	58.95%	58.92%	58.91%	58.92%	58.90%	58.88%
2016	59.76%	59.75%	59.76%	59.82%	59.83%	59.81%	59.79%	59.84%	59.82%	59.81%
2017	57.47%	57.44%	57.44%	57.44%	57.42%	57.45%	57.43%	57.42%	57.40%	57.39%
2018	57.62%	57.62%	57.63%	57.60%	57.61%	57.59%	57.57%	57.57%	57.55%	57.57%
2019	59.09%	59.04%	59.00%	58.98%	58.96%	58.93%	58.96%	58.97%	58.95%	58.95%
2020	61.07%	61.00%	60.98%	60.92%	60.86%	60.79%	60.82%	60.78%	60.75%	60.73%

Fiscal Year	21	22	23	24	25	26	27	28	29	30
1990	49.90%	49.93%	49.95%	49.96%	49.96%	49.97%	49.98%	49.98%	49.98%	49.98%
1991	49.87%	49.89%	49.90%	49.91%	49.92%	49.92%	49.93%	49.93%	49.93%	49.93%
1992	47.44%	47.45%	47.46%	47.45%	47.46%	47.47%	47.46%	47.45%	47.45%	47.45%
1993	44.14%	44.13%	44.14%	44.17%	44.19%	44.19%	44.19%	44.20%	44.20%	44.21%
1994	41.13%	41.16%	41.21%	41.22%	41.22%	41.23%	41.24%	41.24%	41.25%	41.25%
1995	38.29%	38.36%	38.39%	38.40%	38.42%	38.43%	38.44%	38.44%	38.45%	38.46%
1996	35.69%	35.76%	35.80%	35.83%	35.84%	35.85%	35.87%	35.88%	35.89%	35.89%
1997	35.84%	35.89%	35.91%	35.93%	35.96%	35.98%	36.00%	36.01%	36.03%	36.04%
1998	36.20%	36.25%	36.28%	36.31%	36.34%	36.37%	36.39%	36.41%	36.42%	36.43%
1999	37.47%	37.52%	37.55%	37.58%	37.62%	37.64%	37.66%	37.68%	37.69%	37.69%
2000	40.43%	40.45%	40.48%	40.51%	40.54%	40.56%	40.57%	40.58%	40.59%	40.60%
2001	45.23%	45.26%	45.29%	45.31%	45.32%	45.33%	45.34%	45.35%	45.36%	45.36%
2002	49.68%	49.70%	49.72%	49.73%	49.74%	49.74%	49.75%	49.75%	49.76%	49.76%
2003	53.92%	53.94%	53.95%	53.96%	53.97%	53.98%	53.98%	53.98%	53.98%	53.98%
2004	56.90%	56.91%	56.91%	56.91%	56.91%	56.92%	56.91%	56.92%	56.92%	56.91%
2005	61.17%	61.18%	61.18%	61.18%	61.18%	61.18%	61.18%	61.18%	61.18%	61.18%
2006	65.45%	65.45%	65.45%	65.44%	65.44%	65.43%	65.43%	65.43%	65.42%	65.42%
2007	67.34%	67.33%	67.33%	67.33%	67.32%	67.32%	67.31%	67.31%	67.31%	67.31%
2008	65.86%	65.86%	65.86%	65.86%	65.86%	65.86%	65.86%	65.86%	65.85%	65.85%
2009	61.59%	61.59%	61.59%	61.59%	61.59%	61.59%	61.59%	61.59%	61.59%	61.59%
2010	57.42%	57.42%	57.43%	57.43%	57.43%	57.44%	57.44%	57.44%	57.44%	57.44%
2011	55.69%	55.70%	55.71%	55.71%	55.71%	55.71%	55.71%	55.71%	55.71%	55.71%
2012	56.71%	56.73%	56.74%	56.75%	56.76%	56.76%	56.77%	56.77%	56.78%	56.77%
2013	58.25%	58.25%	58.23%	58.22%	58.22%	58.21%	58.20%	58.20%	58.18%	58.17%
2014	56.75%	56.74%	56.76%	56.74%	56.75%	56.75%	56.75%	56.75%	56.75%	56.75%
2015	58.89%	58.88%	58.88%	58.87%	58.86%	58.86%	58.86%	58.85%	58.84%	58.83%
2016	59.79%	59.77%	59.77%	59.77%	59.76%	59.76%	59.76%	59.76%	59.75%	59.74%
2017	57.37%	57.36%	57.37%	57.36%	57.36%	57.35%	57.34%	57.34%	57.33%	57.33%
2018	57.56%	57.57%	57.57%	57.56%	57.55%	57.55%	57.54%	57.53%	57.53%	57.52%
2019	58.95%	58.96%	58.94%	58.94%	58.94%	58.93%	58.93%	58.93%	58.92%	58.92%
2020	60.72%	60.70%	60.68%	60.68%	60.67%	60.66%	60.65%	60.64%	60.64%	60.63%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Active Loans
ARM

Table 1: Number of Loans Active at the End of Each Evaluation Year

	Evaluation Year																														
Fiscal Year	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	31
1990	6,589	6,454	6,064	5,399	4,678	4,227	3,622	3,134	2,538	2,078	1,782	1,427	1,123	870	704	599	492	434	404	378	360	345	332	318	305	277	261	242	211	173	24
1991	29,276	28,776	26,865	24,241	22,186	19,161	16,500	13,233	10,501	9,008	7,040	5,313	3,924	3,066	2,553	2,042	1,746	1,587	1,464	1,394	1,340	1,284	1,224	1,171	1,111	1,034	952	858	781	658	0
1992	90,827	87,695	80,784	73,927	62,865	53,824	41,986	32,735	27,837	21,689	16,370	11,936	9,392	7,764	6,456	5,472	4,845	4,530	4,276	4,085	3,904	3,692	3,485	3,255	3,008	2,785	2,517	2,225	1,988	1,756	133
1993	114,654	109,563	102,198	87,644	75,669	59,146	45,951	39,121	29,173	21,360	14,996	11,329	9,100	7,489	6,269	5,595	5,202	4,925	4,722	4,528	4,315	4,087	3,841	3,562	3,292	3,010	2,682	2,423	2,165	1,814	159
1994	181,234	174,900	154,513	133,565	102,894	79,919	68,044	51,134	37,644	26,364	19,625	15,495	12,531	10,413	9,227	8,623	8,182	7,840	7,542	7,190	6,820	6,423	5,987	5,537	5,056	4,611	4,274	3,852	3,483	2,947	268
1995	123,365	112,383	94,193	61,706	44,635	37,101	27,051	19,653	13,878	10,182	7,739	6,033	4,949	4,383	4,129	3,930	3,782	3,657	3,476	3,318	3,143	2,946	2,762	2,530	2,326	2,156	1,978	1,840	1,678	1,436	121
1996	183,893	172,247	114,757	75,373	60,647	40,904	29,025	20,404	14,810	11,277	8,852	7,145	6,217	5,778	5,444	5,218	5,005	4,773	4,511	4,252	3,979	3,691	3,445	3,201	2,991	2,725	2,483	2,285	2,089	1,811	289
1997	238,578	199,703	131,390	103,194	62,547	43,563	30,315	22,027	16,710	12,851	10,234	8,862	8,223	7,742	7,427	7,138	6,803	6,427	6,062	5,654	5,226	4,857	4,506	4,194	3,804	3,523	3,242	2,994	2,766	2,434	235
1998	92,851	71,704	58,202	36,560	25,305	17,449	12,421	9,131	6,877	5,294	4,454	4,067	3,827	3,643	3,467	3,262	3,076	2,914	2,712	2,518	2,344	2,162	2,020	1,826	1,683	1,539	1,421	1,297	1,187	980	27
1999	61,725	58,800	39,020	26,298	17,849	12,903	9,204	6,625	4,794	3,915	3,550	3,288	3,122	2,955	2,757	2,582	2,414	2,222	2,041	1,880	1,734	1,595	1,452	1,335	1,222	1,114	1,014	929	849	756	167
2000	66,715	47,565	33,733	23,538	17,433	12,579	9,093	6,574	5,295	4,777	4,409	4,198	3,955	3,653	3,412	3,177	2,908	2,656	2,415	2,200	2,021	1,806	1,669	1,551	1,437	1,345	1,250	1,145	1,046	903	43
2001	26,320	21,098	14,966	10,915	7,407	5,012	3,387	2,707	2,377	2,184	2,038	1,919	1,772	1,636	1,507	1,385	1,240	1,122	1,021	942	856	780	711	657	606	570	532	487	434	357	57
2002	83,571	60,222	45,095	30,790	20,497	13,344	10,188	8,937	8,081	7,525	7,007	6,399	5,901	5,393	4,902	4,440	3,965	3,563	3,248	2,867	2,607	2,371	2,173	2,033	1,840	1,683	1,535	1,394	1,238	1,074	73
2003	52,117	40,764	27,325	17,612	11,282	8,386	7,314	6,545	6,075	5,649	5,126	4,734	4,337	3,892	3,432	3,054	2,684	2,448	2,158	1,953	1,779	1,618	1,497	1,362	1,232	1,124	1,016	902	792	650	6
2004	85,460	62,692	41,943	27,149	20,433	17,702	16,006	14,990	13,935	12,699	11,691	10,702	9,668	8,676	7,734	6,916	6,306	5,625	5,101	4,674	4,271	3,905	3,593	3,287	2,990	2,717	2,485	2,259	2,029	1,581	5
2005	43,298	34,536	25,744	19,660	17,141	15,458	14,442	13,455	12,195	11,161	10,116	9,087	8,107	7,152	6,285	5,690	5,110	4,695	4,332	4,015	3,713	3,445	3,207	2,958	2,713	2,488	2,311	2,120	1,953	1,587	3
2006	9,822	8,436	6,683	5,355	4,623	4,239	3,850	3,447	3,144	2,868	2,567	2,293	2,035	1,801	1,621	1,460	1,354	1,249	1,165	1,095	1,024	941	884	825	758	700	656	619	565	407	1
2007	4,484	3,908	3,001	2,371	2,085	1,826	1,551	1,426	1,295	1,165	1,022	914	820	757	690	628	576	542	502	472	447	416	390	361	332	305	282	261	232	193	0
2008	12,057	9,144	7,285	5,999	4,918	3,722	3,117	2,705	2,363	2,059	1,813	1,597	1,441	1,281	1,163	1,049	947	861	804	753	685	627	585	536	479	427	391	346	315	272	1
2009	12,950	10,750	9,093	7,858	6,189	5,263	4,582	3,963	3,431	2,908	2,459	2,137	1,790	1,530	1,338	1,189	1,050	945	848	766	685	595	522	475	424	381	343	312	269	206	7
2010	45,749	41,957	38,509	32,174	26,766	21,765	18,345	15,483	12,981	10,727	9,191	7,601	6,519	5,633	5,003	4,458	3,944	3,472	3,075	2,721	2,426	2,172	1,944	1,739	1,546	1,385	1,238	1,116	1,005	833	1
2011	50,298	45,941	37,716	30,926	23,910	18,602	15,260	12,595	10,208	8,590	7,016	5,959	5,190	4,536	4,045	3,521	3,112	2,738	2,425	2,138	1,900	1,684	1,512	1,354	1,213	1,099	996	893	789	671	2
2012	19,812	16,659	13,548	10,405	7,783	5,960	4,839	3,845	3,218	2,573	2,174	1,859	1,633	1,451	1,265	1,130	1,006	863	768	669	588	521	474	424	371	330	289	254	216	166	0
2013	9,055	7,853	6,197	4,684	3,504	2,668	2,032	1,624	1,292	1,056	897	770	685	619	548	481	423	365	321	276	246	203	174	149	122	107	96	80	70	56	0
2014	18,630	13,193	9,141	6,598	4,947	3,553	2,661	2,089	1,743	1,482	1,297	1,140	1,013	914	819	732	665	597	527	470	421	384	355	318	283	249	219	199	174	141	3
2015	11,705	8,869	6,470	4,807	3,566	2,504	1,877	1,484	1,240	1,045	919	793	700	625	551	477	420	369	331	287	245	220	201	177	158	135	117	100	89	71	1
2016	4,297	3,428	2,699	2,117	1,500	1,128	876	709	577	480	411	360	302	261	225	197	174	151	131	115	105	95	82	70	65	60	57	49	44	30	0
2017	3,745	3,222	2,661	1,897	1,402	1,109	896	748	611	524	447	383	333	299	257	224	193	167	148	128	113	92	77	66	59	47	42	39	33	27	0
2018	3,706	3,099	2,169	1,576	1,259	1,015	858	708	594	521	445	382	350	308	269	238	215	188	167	140	121	106	93	80	72	64	54	50	45	34	0
2019	3,177	2,095	1,465	1,113	863	688	570	485	388	331	287	256	230	212	188	161	145	124	111	97	79	76	68	59	55	52	45	40	37	25	0
2020	314	192	138	96	78	62	46	37	29	24	23	22	16	14	12	9	7	7	6	5	5	4	3	3	3	2	1	1	1	1	0

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Conditional Claim Rate
ARM

Table 2: Number of Claims in Each Evaluation Year

	Evaluation Year																													
Fiscal Year	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	14	43	67	77	57	73	72	55	30	26	11	6	6	3	1	1	1	0	0	2	1	0	0	2	0	1	0	1	0
1991	1	24	173	250	298	322	384	329	219	160	78	40	24	21	10	7	2	3	3	9	2	9	5	2	3	7	6	2	1	0
1992	1	122	536	783	1,040	1,272	1,075	710	481	224	132	103	52	23	17	10	12	22	17	11	13	20	18	15	21	7	8	7	0	0
1993	4	199	778	1,353	2,016	1,686	1,202	765	374	223	178	79	38	24	27	17	20	25	17	20	23	20	22	22	16	9	7	3	4	5
1994	6	378	1,783	3,386	3,504	2,607	1,556	787	493	366	191	86	60	33	35	36	58	44	38	50	42	31	35	26	20	13	4	13	11	3
1995	8	352	1,877	2,876	2,545	1,425	807	541	475	257	120	83	37	41	39	52	40	31	47	37	38	47	35	26	16	6	6	1	7	8
1996	4	538	2,699	4,009	2,811	1,654	1,168	974	486	224	145	86	110	90	86	76	73	79	67	74	84	50	21	23	7	12	5	3	4	6
1997	9	851	3,435	4,011	2,955	2,180	1,723	835	425	253	179	162	145	171	117	125	120	104	111	113	70	41	26	12	23	21	15	17	10	7
1998	16	672	1,421	1,330	1,085	846	477	241	150	97	92	87	79	62	82	71	55	42	66	30	23	14	3	8	6	6	4	3	3	1
1999	2	96	513	777	935	536	278	152	105	84	97	97	76	86	86	53	51	39	37	23	10	3	13	7	7	3	1	3	1	1
2000	3	270	781	1,118	723	457	293	218	217	174	154	126	125	135	82	66	59	59	24	21	7	16	8	10	5	1	9	6	4	3
2001	0	57	309	306	203	149	125	103	127	95	82	60	69	42	32	32	16	8	6	2	3	7	4	4	0	1	2	1	1	1
2002	2	212	972	892	765	620	633	529	491	347	331	306	204	157	146	82	49	26	11	20	10	18	14	9	7	2	5	1	8	1
2003	4	267	663	606	561	582	461	422	296	279	263	156	99	93	68	30	19	11	22	12	8	9	4	4	3	7	0	4	0	1
2004	59	627	1,242	1,392	1,515	1,306	1,015	693	724	703	438	319	268	158	102	60	24	46	14	19	22	22	10	16	16	9	6	4	10	1
2005	35	459	980	1,305	1,244	1,098	748	704	719	510	417	279	174	119	65	34	48	30	28	25	20	16	23	15	17	9	6	2	4	3
2006	5	133	306	444	466	296	288	212	161	119	110	63	39	28	11	13	13	9	7	6	6	7	0	4	10	4	2	0	0	2
2007	1	59	196	276	190	167	149	76	59	60	48	26	22	3	9	7	4	6	1	5	5	1	2	3	3	2	1	0	4	0
2008	1	93	397	511	469	506	390	201	139	104	48	34	11	21	6	7	7	7	8	5	2	5	5	1	2	2	0	0	2	0
2009	12	152	339	409	555	432	256	222	138	80	48	35	33	19	12	9	7	7	9	6	5	5	4	0	1	0	1	1	1	0
2010	20	236	596	1,055	1,071	724	578	359	264	165	70	73	47	34	29	31	20	14	14	8	8	4	6	5	3	2	0	0	2	4
2011	10	192	540	594	522	372	280	193	112	45	81	33	33	34	21	13	11	11	6	1	7	11	4	3	7	1	0	0	2	1
2012	7	98	153	126	141	102	79	47	15	45	26	19	9	10	6	5	5	3	3	3	1	1	1	1	0	0	1	0	0	0
2013	3	16	32	47	34	37	23	9	14	12	8	8	6	4	3	1	1	1	1	2	0	0	1	2	0	0	0	0	0	0
2014	0	19	53	76	50	47	25	50	21	18	17	12	10	7	1	1	0	2	0	1	0	1	1	0	0	0	0	0	1	1
2015	0	11	38	30	26	18	41	19	15	12	8	6	4	1	2	2	3	0	0	2	3	0	0	1	0	0	0	1	0	0
2016	0	2	7	12	5	16	10	7	8	5	2	2	2	1	3	3	1	0	1	0	0	1	0	0	0	0	0	0	0	0
2017	0	2	5	5	33	11	9	9	9	2	5	0	3	0	2	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0
2018	0	7	7	35	20	25	18	17	16	9	2	2	0	3	1	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0
2019	0	2	35	23	19	17	20	3	8	4	3	4	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
2020	0	5	3	3	2	3	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 3: Conditional Claim Rate = Table 2 / Table 1
Percentage of Active Loans at the Beginnng of the Evaluation Year that end in Claim During the Evaluation Year

	Evaluation Year																													
Fiscal Year	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%	0.22%	0.71%	1.24%	1.65%	1.35%	2.02%	2.30%	2.17%	1.44%	1.46%	0.77%	0.53%	0.69%	0.43%	0.17%	0.20%	0.23%	0.00%	0.00%	0.56%	0.29%	0.00%	0.00%	0.66%	0.00%	0.38%	0.00%	0.47%	0.00%
1991	0.00%	0.08%	0.64%	1.03%	1.34%	1.68%	2.33%	2.49%	2.09%	1.78%	1.11%	0.75%	0.61%	0.68%	0.39%	0.34%	0.11%	0.19%	0.20%	0.65%	0.15%	0.70%	0.41%	0.17%	0.27%	0.68%	0.63%	0.23%	0.13%	0.00%
1992	0.00%	0.14%	0.66%	1.06%	1.65%	2.36%	2.56%	2.17%	1.73%	1.03%	0.81%	0.86%	0.55%	0.30%	0.26%	0.18%	0.25%	0.49%	0.40%	0.27%	0.33%	0.54%	0.52%	0.46%	0.70%	0.25%	0.32%	0.31%	0.00%	0.00%
1993	0.00%	0.18%	0.76%	1.54%	2.66%	2.85%	2.62%	1.96%	1.28%	1.04%	1.19%	0.70%	0.42%	0.32%	0.43%	0.30%	0.38%	0.51%	0.36%	0.44%	0.53%	0.49%	0.57%	0.62%	0.49%	0.30%	0.26%	0.12%	0.18%	0.28%
1994	0.00%	0.22%	1.15%	2.54%	3.41%	3.26%	2.29%	1.54%	1.31%	1.39%	0.97%	0.56%	0.48%	0.32%	0.38%	0.42%	0.71%	0.56%	0.50%	0.70%	0.62%	0.48%	0.58%	0.47%	0.40%	0.28%	0.09%	0.34%	0.32%	0.10%
1995	0.01%	0.31%	1.99%	4.66%	5.70%	3.84%	2.98%	2.75%	3.42%	2.52%	1.55%	1.38%	0.75%	0.94%	0.94%	1.32%	1.06%	0.85%	1.35%	1.12%	1.21%	1.60%	1.27%	1.03%	0.69%	0.28%	0.30%	0.05%	0.42%	0.56%
1996	0.00%	0.31%	2.35%	5.32%	4.64%	4.04%	4.02%	4.77%	3.28%	1.99%	1.64%	1.20%	1.77%	1.56%	1.58%	1.46%	1.46%	1.66%	1.49%	1.74%	2.11%	1.35%	0.61%	0.72%	0.23%	0.44%	0.20%	0.13%	0.19%	0.33%
1997	0.00%	0.43%	2.61%	3.89%	4.72%	5.00%	5.68%	3.79%	2.54%	1.97%	1.75%	1.83%	1.76%	2.21%	1.58%	1.75%	1.76%	1.62%	1.83%	2.00%	1.34%	0.84%	0.58%	0.29%	0.60%	0.60%	0.46%	0.57%	0.36%	0.29%
1998	0.02%	0.94%	2.44%	3.64%	4.29%	4.85%	3.84%	2.64%	2.18%	1.83%	2.07%	2.14%	2.06%	1.70%	2.37%	2.18%	1.79%	1.44%	2.43%	1.19%	0.98%	0.65%	0.15%	0.44%	0.36%	0.39%	0.28%	0.23%	0.25%	0.10%
1999	0.00%	0.16%	1.31%	2.95%	5.24%	4.15%	3.02%	2.29%	2.19%	2.15%	2.73%	2.95%	2.43%	2.91%	3.12%	2.05%	2.11%	1.76%	1.81%	1.22%	0.58%	0.19%	0.90%	0.52%	0.57%	0.27%	0.10%	0.32%	0.12%	0.13%
2000	0.00%	0.57%	2.32%	4.75%	4.15%	3.63%	3.22%	3.32%	4.10%	3.64%	3.49%	3.00%	3.16%	3.70%	2.40%	2.08%	2.03%	2.22%	0.99%	0.95%	0.35%	0.89%	0.48%	0.64%	0.35%	0.07%	0.72%	0.52%	0.38%	0.33%
2001	0.00%	0.27%	2.06%	2.80%	2.74%	2.97%	3.69%	3.80%	5.34%	4.35%	4.02%	3.13%	3.89%	2.57%	2.12%	2.31%	1.29%	0.71%	0.59%	0.21%	0.35%	0.90%	0.56%	0.61%	0.00%	0.18%	0.38%	0.21%	0.23%	0.28%
2002	0.00%	0.35%	2.16%	2.90%	3.73%	4.65%	6.21%	5.92%	6.08%	4.61%	4.72%	4.78%	3.46%	2.91%	2.98%	1.85%	1.24%	0.73%	0.34%	0.70%	0.38%	0.76%	0.64%	0.44%	0.38%	0.12%	0.33%	0.07%	0.65%	0.09%
2003	0.01%	0.65%	2.43%	3.44%	4.97%	6.94%	6.30%	6.45%	4.87%	4.94%	5.13%	3.30%	2.28%	2.39%	1.98%	0.98%	0.71%	0.45%	1.02%	0.61%	0.45%	0.56%	0.27%	0.29%	0.24%	0.62%	0.00%	0.44%	0.00%	0.15%
2004	0.07%	1.00%	2.96%	5.13%	7.41%	7.38%	6.34%	4.62%	5.20%	5.54%	3.75%	2.98%	2.77%	1.82%	1.32%	0.87%	0.38%	0.82%	0.27%	0.41%	0.52%	0.56%	0.28%	0.49%	0.54%	0.33%	0.24%	0.18%	0.49%	0.06%
2005	0.08%	1.33%	3.81%	6.64%	7.26%	7.10%	5.18%	5.23%	5.90%	4.57%	4.12%	3.07%	2.15%	1.66%	1.03%	0.60%	0.94%	0.64%	0.65%	0.62%	0.54%	0.46%	0.72%	0.51%	0.63%	0.36%	0.26%	0.09%	0.20%	0.19%
2006	0.05%	1.58%	4.58%	8.29%	10.08%	6.98%	7.48%	6.15%	5.12%	4.15%	4.29%	2.75%	1.92%	1.55%	0.68%	0.89%	0.96%	0.72%	0.60%	0.55%	0.59%	0.74%	0.00%	0.48%	1.32%	0.57%	0.30%	0.00%	0.00%	0.49%
2007	0.02%	1.51%	6.53%	11.64%	9.11%	9.15%	9.61%	5.33%	4.56%	5.15%	4.70%	2.84%	2.68%	0.40%	1.30%	1.11%	0.69%	1.11%	0.20%	1.06%	1.12%	0.24%	0.51%	0.83%	0.90%	0.66%	0.35%	0.00%	1.72%	0.00%
2008	0.01%	1.02%	5.45%	8.52%	9.54%	13.59%	12.51%	7.43%	5.88%	5.05%	2.65%	2.13%	0.76%	1.64%	0.52%	0.67%	0.74%	0.81%	1.00%	0.66%	0.29%	0.80%	0.85%	0.19%	0.42%	0.47%	0.00%	0.00%	0.63%	0.00%
2009	0.09%	1.41%	3.73%	5.20%	8.97%	8.21%	5.59%	5.60%	4.02%	2.75%	1.95%	1.64%	1.84%	1.24%	0.90%	0.76%	0.67%	0.74%	1.06%	0.78%	0.73%	0.84%	0.77%	0.00%	0.24%	0.00%	0.29%	0.32%	0.37%	0.00%
2010	0.04%	0.56%	1.55%	3.28%	4.00%	3.33%	3.15%	2.32%	2.03%	1.54%	0.76%	0.96%	0.72%	0.60%	0.58%	0.70%	0.51%	0.40%	0.46%	0.29%	0.33%	0.18%	0.31%	0.29%	0.19%	0.14%	0.00%	0.00%	0.20%	0.48%
2011	0.02%	0.42%	1.43%	1.92%	2.18%	2.00%	1.83%	1.53%	1.10%	0.52%	1.15%	0.55%	0.64%	0.75%	0.52%	0.37%	0.35%	0.40%	0.25%	0.05%	0.37%	0.65%	0.26%	0.22%	0.58%	0.09%	0.00%	0.00%	0.25%	0.15%
2012	0.04%	0.59%	1.13%	1.21%	1.81%	1.71%	1.63%	1.22%	0.47%	1.75%	1.20%	1.02%	0.55%	0.69%	0.47%	0.44%	0.50%	0.35%	0.39%	0.45%	0.17%	0.19%	0.21%	0.24%	0.00%	0.00%	0.35%	0.00%	0.00%	0.00%
2013	0.03%	0.20%	0.52%	1.00%	0.97%	1.39%	1.13%	0.55%	1.08%	1.14%	0.89%	1.04%	0.88%	0.65%	0.55%	0.21%	0.24%	0.27%	0.31%	0.72%	0.00%	0.00%	0.57%	1.34%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2014	0.00%	0.14%	0.58%	1.15%	1.01%	1.32%	0.94%	2.39%	1.20%	1.21%	1.31%	1.05%	0.99%	0.77%	0.12%	0.14%	0.00%	0.34%	0.00%	0.21%	0.00%	0.26%	0.28%	0.00%	0.00%	0.00%	0.00%	0.00%	0.57%	0.71%
2015	0.00%	0.12%	0.59%	0.62%	0.73%	0.72%	2.18%	1.28%	1.21%	1.15%	0.87%	0.76%	0.57%	0.16%	0.36%	0.42%	0.71%	0.00%	0.00%	0.70%	1.22%	0.00%	0.00%	0.56%	0.00%	0.00%	0.00%	1.00%	0.00%	0.00%
2016	0.00%	0.06%	0.26%	0.57%	0.33%	1.42%	1.14%	0.99%	1.39%	1.04%	0.49%	0.56%	0.66%	0.38%	1.33%	1.52%	0.57%	0.00%	0.76%	0.00%	0.00%	1.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2017	0.00%	0.06%	0.19%	0.26%	2.35%	0.99%	1.00%	1.20%	1.47%	0.38%	1.12%	0.00%	0.90%	0.00%	0.78%	0.45%	0.52%	0.60%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.13%	0.00%	0.00%	0.00%	0.00%
2018	0.00%	0.23%	0.32%	2.22%	1.59%	2.46%	2.10%	2.40%	2.69%	1.73%	0.45%	0.52%	0.00%	0.97%	0.37%	0.42%	0.00%	0.53%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.85%	0.00%	0.00%	0.00%
2019	0.00%	0.10%	2.39%	2.07%	2.20%	2.47%	3.51%	0.62%	2.06%	1.21%	1.05%	1.56%	0.43%	0.47%	0.53%	0.62%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.22%	0.00%	0.00%	0.00%
2020	0.00%	2.60%	2.17%	3.13%	2.56%	4.84%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	8.33%	11.11%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Cumulative Claim Rate
ARM

Table 4: Cumulative Number of Claims as of Each Evaluation Year
Total Number of Claims for each Fiscal Year as of the End of the Evaluation Year

	Evaluation Year																													
Fiscal Year	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	14	57	124	201	258	331	403	458	488	514	525	531	537	540	541	542	543	543	543	545	546	546	546	548	548	549	549	550	550
1991	1	25	198	448	746	1,068	1,452	1,781	2,000	2,160	2,238	2,278	2,302	2,323	2,333	2,340	2,342	2,345	2,348	2,357	2,359	2,368	2,373	2,375	2,378	2,385	2,391	2,393	2,394	2,394
1992	1	123	659	1,442	2,482	3,754	4,829	5,539	6,020	6,244	6,376	6,479	6,531	6,554	6,571	6,581	6,593	6,615	6,632	6,643	6,656	6,676	6,694	6,709	6,730	6,737	6,745	6,752	6,752	6,752
1993	4	203	981	2,334	4,350	6,036	7,238	8,003	8,377	8,600	8,778	8,857	8,895	8,919	8,946	8,963	8,983	9,008	9,025	9,045	9,068	9,088	9,110	9,132	9,148	9,157	9,164	9,167	9,171	9,176
1994	6	384	2,167	5,553	9,057	11,664	13,220	14,007	14,500	14,866	15,057	15,143	15,203	15,236	15,271	15,307	15,365	15,409	15,447	15,497	15,539	15,570	15,605	15,631	15,651	15,664	15,668	15,681	15,692	15,695
1995	8	360	2,237	5,113	7,658	9,083	9,890	10,431	10,906	11,163	11,283	11,366	11,403	11,444	11,483	11,535	11,575	11,606	11,653	11,690	11,728	11,775	11,810	11,836	11,852	11,858	11,864	11,865	11,872	11,880
1996	4	542	3,241	7,250	10,061	11,715	12,883	13,857	14,343	14,567	14,712	14,798	14,908	14,998	15,084	15,160	15,233	15,312	15,379	15,453	15,537	15,587	15,608	15,631	15,638	15,650	15,655	15,658	15,662	15,668
1997	9	860	4,295	8,306	11,261	13,441	15,164	15,999	16,424	16,677	16,856	17,018	17,163	17,334	17,451	17,576	17,696	17,800	17,911	18,024	18,094	18,135	18,161	18,173	18,196	18,217	18,232	18,249	18,259	18,266
1998	16	688	2,109	3,439	4,524	5,370	5,847	6,088	6,238	6,335	6,427	6,514	6,593	6,655	6,737	6,808	6,863	6,905	6,971	7,001	7,024	7,038	7,041	7,049	7,055	7,061	7,065	7,068	7,071	7,072
1999	2	98	611	1,388	2,323	2,859	3,137	3,289	3,394	3,478	3,575	3,672	3,748	3,834	3,920	3,973	4,024	4,063	4,100	4,123	4,133	4,136	4,149	4,156	4,163	4,166	4,167	4,170	4,171	4,172
2000	3	273	1,054	2,172	2,895	3,352	3,645	3,863	4,080	4,254	4,408	4,534	4,659	4,794	4,876	4,942	5,001	5,060	5,084	5,105	5,112	5,128	5,136	5,146	5,151	5,152	5,161	5,167	5,171	5,174
2001	0	57	366	672	875	1,024	1,149	1,252	1,379	1,474	1,556	1,616	1,685	1,727	1,759	1,791	1,807	1,815	1,821	1,823	1,826	1,833	1,837	1,841	1,841	1,842	1,844	1,845	1,846	1,847
2002	2	214	1,186	2,078	2,843	3,463	4,096	4,625	5,116	5,463	5,794	6,100	6,304	6,461	6,607	6,689	6,738	6,764	6,775	6,795	6,805	6,823	6,837	6,846	6,853	6,855	6,860	6,861	6,869	6,870
2003	4	271	934	1,540	2,101	2,683	3,144	3,566	3,862	4,141	4,404	4,560	4,659	4,752	4,820	4,850	4,869	4,880	4,902	4,914	4,922	4,931	4,935	4,939	4,942	4,949	4,949	4,953	4,953	4,954
2004	59	686	1,928	3,320	4,835	6,141	7,156	7,849	8,573	9,276	9,714	10,033	10,301	10,459	10,561	10,621	10,645	10,691	10,705	10,724	10,746	10,768	10,778	10,794	10,810	10,819	10,825	10,829	10,839	10,840
2005	35	494	1,474	2,779	4,023	5,121	5,869	6,573	7,292	7,802	8,219	8,498	8,672	8,791	8,856	8,890	8,938	8,968	8,996	9,021	9,041	9,057	9,080	9,095	9,112	9,121	9,127	9,129	9,133	9,136
2006	5	138	444	888	1,354	1,650	1,938	2,150	2,311	2,430	2,540	2,603	2,642	2,670	2,681	2,694	2,707	2,716	2,723	2,729	2,735	2,742	2,742	2,746	2,756	2,760	2,762	2,762	2,762	2,764
2007	1	60	256	532	722	889	1,038	1,114	1,173	1,233	1,281	1,307	1,329	1,332	1,341	1,348	1,352	1,358	1,359	1,364	1,369	1,370	1,372	1,375	1,378	1,380	1,381	1,381	1,385	1,385
2008	1	94	491	1,002	1,471	1,977	2,367	2,568	2,707	2,811	2,859	2,893	2,904	2,925	2,931	2,938	2,945	2,952	2,960	2,965	2,967	2,972	2,977	2,978	2,980	2,982	2,982	2,982	2,984	2,984
2009	12	164	503	912	1,467	1,899	2,155	2,377	2,515	2,595	2,643	2,678	2,711	2,730	2,742	2,751	2,758	2,765	2,774	2,780	2,785	2,790	2,794	2,794	2,795	2,795	2,796	2,797	2,798	2,798
2010	20	256	852	1,907	2,978	3,702	4,280	4,639	4,903	5,068	5,138	5,211	5,258	5,292	5,321	5,352	5,372	5,386	5,400	5,408	5,416	5,420	5,426	5,431	5,434	5,436	5,436	5,436	5,438	5,442
2011	10	202	742	1,336	1,858	2,230	2,510	2,703	2,815	2,860	2,941	2,974	3,007	3,041	3,062	3,075	3,086	3,097	3,103	3,104	3,111	3,122	3,126	3,129	3,136	3,137	3,137	3,137	3,139	3,140
2012	7	105	258	384	525	627	706	753	768	813	839	858	867	877	883	888	893	896	899	902	903	904	905	906	906	906	907	907	907	907
2013	3	19	51	98	132	169	192	201	215	227	235	243	249	253	256	257	258	259	260	262	262	262	263	265	265	265	265	265	265	265
2014	0	19	72	148	198	245	270	320	341	359	376	388	398	405	406	407	407	409	409	410	410	411	412	412	412	412	412	412	413	414
2015	0	11	49	79	105	123	164	183	198	210	218	224	228	229	231	233	236	236	236	238	241	241	241	242	242	242	242	243	243	243
2016	0	2	9	21	26	42	52	59	67	72	74	76	78	79	82	85	86	86	87	87	87	88	88	88	88	88	88	88	88	88
2017	0	2	7	12	45	56	65	74	83	85	90	90	93	93	95	96	97	98	98	98	98	98	98	98	99	99	99	99	99	99
2018	0	7	14	49	69	94	112	129	145	154	156	158	158	161	162	163	163	164	164	164	164	164	164	164	164	164	165	165	165	165
2019	0	2	37	60	79	96	116	119	127	131	134	138	139	140	141	142	142	142	142	142	142	142	142	142	142	142	143	143	143	143
2020	0	5	8	11	13	16	16	16	16	16	16	16	16	16	17	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18

Table 5: Cumulative Claim Rate = Table 4 / Table 1 (Evaluation Year 1)
Cumulative Claims as of Evaluation Year Divided by Active Loans as of Evaluation Year 1

	Evaluation Year																													
Fiscal Year	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%	0.21%	0.87%	1.88%	3.05%	3.92%	5.02%	6.12%	6.95%	7.41%	7.80%	7.97%	8.06%	8.15%	8.20%	8.21%	8.23%	8.24%	8.24%	8.24%	8.27%	8.29%	8.29%	8.29%	8.32%	8.32%	8.33%	8.33%	8.35%	8.35%
1991	0.00%	0.09%	0.68%	1.53%	2.55%	3.65%	4.96%	6.08%	6.83%	7.38%	7.64%	7.78%	7.86%	7.93%	7.97%	7.99%	8.00%	8.01%	8.02%	8.05%	8.06%	8.09%	8.11%	8.11%	8.12%	8.15%	8.17%	8.17%	8.18%	8.18%
1992	0.00%	0.14%	0.73%	1.59%	2.73%	4.13%	5.32%	6.10%	6.63%	6.87%	7.02%	7.13%	7.19%	7.22%	7.23%	7.25%	7.26%	7.28%	7.30%	7.31%	7.33%	7.35%	7.37%	7.39%	7.41%	7.42%	7.43%	7.43%	7.43%	7.43%
1993	0.00%	0.18%	0.86%	2.04%	3.79%	5.26%	6.31%	6.98%	7.31%	7.50%	7.66%	7.72%	7.76%	7.78%	7.80%	7.82%	7.83%	7.86%	7.87%	7.89%	7.91%	7.93%	7.95%	7.96%	7.98%	7.99%	7.99%	8.00%	8.00%	8.00%
1994	0.00%	0.21%	1.20%	3.06%	5.00%	6.44%	7.29%	7.73%	8.00%	8.20%	8.31%	8.36%	8.39%	8.41%	8.43%	8.45%	8.48%	8.50%	8.52%	8.55%	8.57%	8.59%	8.61%	8.62%	8.64%	8.64%	8.65%	8.65%	8.66%	8.66%
1995	0.01%	0.29%	1.81%	4.14%	6.21%	7.36%	8.02%	8.46%	8.84%	9.05%	9.15%	9.21%	9.24%	9.28%	9.31%	9.35%	9.38%	9.41%	9.45%	9.48%	9.51%	9.54%	9.57%	9.59%	9.61%	9.61%	9.62%	9.62%	9.62%	9.63%
1996	0.00%	0.29%	1.76%	3.94%	5.47%	6.37%	7.01%	7.54%	7.80%	7.92%	8.00%	8.05%	8.11%	8.16%	8.20%	8.24%	8.28%	8.33%	8.36%	8.40%	8.45%	8.48%	8.49%	8.50%	8.50%	8.51%	8.51%	8.51%	8.52%	8.52%
1997	0.00%	0.36%	1.80%	3.48%	4.72%	5.63%	6.36%	6.71%	6.88%	6.99%	7.07%	7.13%	7.19%	7.27%	7.31%	7.37%	7.42%	7.46%	7.51%	7.55%	7.58%	7.60%	7.61%	7.62%	7.63%	7.64%	7.64%	7.65%	7.65%	7.66%
1998	0.02%	0.74%	2.27%	3.70%	4.87%	5.78%	6.30%	6.56%	6.72%	6.82%	6.92%	7.02%	7.10%	7.17%	7.26%	7.33%	7.39%	7.44%	7.51%	7.54%	7.56%	7.58%	7.58%	7.59%	7.60%	7.60%	7.61%	7.61%	7.62%	7.62%
1999	0.00%	0.16%	0.99%	2.25%	3.76%	4.63%	5.08%	5.33%	5.50%	5.63%	5.79%	5.95%	6.07%	6.21%	6.35%	6.44%	6.52%	6.58%	6.64%	6.68%	6.70%	6.70%	6.72%	6.73%	6.74%	6.75%	6.75%	6.76%	6.76%	6.76%
2000	0.00%	0.41%	1.58%	3.26%	4.34%	5.02%	5.46%	5.79%	6.12%	6.38%	6.61%	6.80%	6.98%	7.19%	7.31%	7.41%	7.50%	7.58%	7.62%	7.65%	7.66%	7.69%	7.70%	7.71%	7.72%	7.72%	7.74%	7.74%	7.75%	7.76%
2001	0.00%	0.22%	1.39%	2.55%	3.32%	3.89%	4.37%	4.76%	5.24%	5.60%	5.91%	6.14%	6.40%	6.56%	6.68%	6.80%	6.87%	6.90%	6.92%	6.93%	6.94%	6.96%	6.98%	6.99%	6.99%	7.00%	7.01%	7.01%	7.01%	7.02%
2002	0.00%	0.26%	1.42%	2.49%	3.40%	4.14%	4.90%	5.53%	6.12%	6.54%	6.93%	7.30%	7.54%	7.73%	7.91%	8.00%	8.06%	8.09%	8.11%	8.13%	8.14%	8.16%	8.18%	8.19%	8.20%	8.20%	8.21%	8.21%	8.22%	8.22%
2003	0.01%	0.52%	1.79%	2.95%	4.03%	5.15%	6.03%	6.84%	7.41%	7.95%	8.45%	8.75%	8.94%	9.12%	9.25%	9.31%	9.34%	9.36%	9.41%	9.43%	9.44%	9.46%	9.47%	9.48%	9.48%	9.50%	9.50%	9.50%	9.50%	9.51%
2004	0.07%	0.80%	2.26%	3.88%	5.66%	7.19%	8.37%	9.18%	10.03%	10.85%	11.37%	11.74%	12.05%	12.24%	12.36%	12.43%	12.46%	12.51%	12.53%	12.55%	12.57%	12.60%	12.61%	12.63%	12.65%	12.66%	12.67%	12.67%	12.68%	12.68%
2005	0.08%	1.14%	3.40%	6.42%	9.29%	11.83%	13.55%	15.18%	16.84%	18.02%	18.98%	19.63%	20.03%	20.30%	20.45%	20.53%	20.64%	20.71%	20.78%	20.83%	20.88%	20.92%	20.97%	21.01%	21.04%	21.07%	21.08%	21.08%	21.09%	21.10%
2006	0.05%	1.41%	4.52%	9.04%	13.79%	16.80%	19.73%	21.89%	23.53%	24.74%	25.86%	26.50%	26.90%	27.18%	27.30%	27.43%	27.56%	27.65%	27.72%	27.78%	27.85%	27.92%	27.92%	27.96%	28.06%	28.10%	28.12%	28.12%	28.12%	28.14%
2007	0.02%	1.34%	5.71%	11.86%	16.10%	19.83%	23.15%	24.84%	26.16%	27.50%	28.57%	29.15%	29.64%	29.71%	29.91%	30.06%	30.15%	30.29%	30.31%	30.42%	30.53%	30.55%	30.60%	30.66%	30.73%	30.78%	30.80%	30.80%	30.89%	30.89%
2008	0.01%	0.78%	4.07%	8.31%	12.20%	16.40%	19.63%	21.30%	22.45%	23.31%	23.71%	23.99%	24.09%	24.26%	24.31%	24.37%	24.43%	24.48%	24.55%	24.59%	24.61%	24.65%	24.69%	24.70%	24.72%	24.73%	24.73%	24.73%	24.75%	24.75%
2009	0.09%	1.27%	3.88%	7.04%	11.33%	14.66%	16.64%	18.36%	19.42%	20.04%	20.41%	20.68%	20.93%	21.08%	21.17%	21.24%	21.30%	21.35%	21.42%	21.47%	21.51%	21.54%	21.58%	21.58%	21.58%	21.58%	21.59%	21.60%	21.61%	21.61%
2010	0.04%	0.56%	1.86%	4.17%	6.51%	8.09%	9.36%	10.14%	10.72%	11.08%	11.23%	11.39%	11.49%	11.57%	11.63%	11.70%	11.74%	11.77%	11.80%	11.82%	11.84%	11.85%	11.86%	11.87%	11.88%	11.88%	11.88%	11.88%	11.89%	11.90%
2011	0.02%	0.40%	1.48%	2.66%	3.69%	4.43%	4.99%	5.37%	5.60%	5.69%	5.85%	5.91%	5.98%	6.05%	6.09%	6.11%	6.14%	6.16%	6.17%	6.17%	6.19%	6.21%	6.21%	6.22%	6.23%	6.24%	6.24%	6.24%	6.24%	6.24%
2012	0.04%	0.53%	1.30%	1.94%	2.65%	3.16%	3.56%	3.80%	3.88%	4.10%	4.23%	4.33%	4.38%	4.43%	4.46%	4.48%	4.51%	4.52%	4.54%	4.55%	4.56%	4.56%	4.57%	4.57%	4.57%	4.57%	4.58%	4.58%	4.58%	4.58%
2013	0.03%	0.21%	0.56%	1.08%	1.46%	1.87%	2.12%	2.22%	2.37%	2.51%	2.60%	2.68%	2.75%	2.79%	2.83%	2.84%	2.85%	2.86%	2.87%	2.89%	2.89%	2.89%	2.90%	2.93%	2.93%	2.93%	2.93%	2.93%	2.93%	2.93%
2014	0.00%	0.10%	0.39%	0.79%	1.06%	1.32%	1.45%	1.72%	1.83%	1.93%	2.02%	2.08%	2.14%	2.17%	2.18%	2.18%	2.18%	2.20%	2.20%	2.20%	2.20%	2.21%	2.21%	2.21%	2.21%	2.21%	2.21%	2.21%	2.22%	2.22%
2015	0.00%	0.09%	0.42%	0.67%	0.90%	1.05%	1.40%	1.56%	1.69%	1.79%	1.86%	1.91%	1.95%	1.96%	1.97%	1.99%	2.02%	2.02%	2.02%	2.03%	2.06%	2.06%	2.06%	2.07%	2.07%	2.07%	2.07%	2.08%	2.08%	2.08%
2016	0.00%	0.05%	0.21%	0.49%	0.61%	0.98%	1.21%	1.37%	1.56%	1.68%	1.72%	1.77%	1.82%	1.84%	1.91%	1.98%	2.00%	2.00%	2.02%	2.02%	2.02%	2.05%	2.05%	2.05%	2.05%	2.05%	2.05%	2.05%	2.05%	2.05%
2017	0.00%	0.05%	0.19%	0.32%	1.20%	1.50%	1.74%	1.98%	2.22%	2.27%	2.40%	2.40%	2.48%	2.48%	2.54%	2.56%	2.59%	2.62%	2.62%	2.62%	2.62%	2.62%	2.62%	2.62%	2.62%	2.64%	2.64%	2.64%	2.64%	2.64%
2018	0.00%	0.19%	0.38%	1.32%	1.86%	2.54%	3.02%	3.48%	3.91%	4.16%	4.21%	4.26%	4.26%	4.34%	4.37%	4.40%	4.40%	4.43%	4.43%	4.43%	4.43%	4.43%	4.43%	4.43%	4.43%	4.43%	4.45%	4.45%	4.45%	4.45%
2019	0.00%	0.06%	1.16%	1.89%	2.49%	3.02%	3.65%	3.75%	4.00%	4.12%	4.22%	4.34%	4.38%	4.41%	4.44%	4.47%	4.47%	4.47%	4.47%	4.47%	4.47%	4.47%	4.47%	4.47%	4.47%	4.47%	4.50%	4.50%	4.50%	4.50%
2020	0.00%	1.59%	2.55%	3.50%	4.14%	5.10%	5.10%	5.10%	5.10%	5.10%	5.10%	5.10%	5.10%	5.10%	5.41%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Conditional Non-Claim Termination Rate
ARM

Table 6: Number of Non-Claim Terminations in Each Evaluation Year

	Evaluation Year																												
Fiscal Year	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	7	121	347	598	644	394	532	416	541	430	270	344	298	247	163	103	106	57	30	26	16	14	13	14	11	22	14	18	28	34
1991	35	476	1,738	2,374	1,757	2,703	2,277	2,938	2,513	1,333	1,890	1,687	1,365	837	503	503	294	156	120	61	52	47	55	51	57	67	75	91	75	110
1992	221	3,010	6,375	6,074	10,022	7,769	10,763	8,541	4,417	5,924	5,187	4,331	2,492	1,605	1,291	973	614	293	237	180	168	192	189	215	226	215	260	285	235	208
1993	758	4,892	6,587	13,201	9,959	14,837	11,993	6,065	9,574	7,590	6,186	3,588	2,191	1,587	1,192	654	373	252	186	174	189	207	224	257	252	270	321	256	252	205
1994	1,176	5,956	18,604	17,562	27,167	20,368	10,319	16,123	12,997	10,914	6,548	4,044	2,904	2,085	1,145	559	383	298	260	301	326	366	401	423	460	430	333	409	348	293
1995	1,622	10,630	16,313	29,611	14,526	6,109	9,243	6,857	5,300	3,439	2,323	1,623	1,047	525	215	145	108	94	134	121	136	150	149	206	188	164	172	137	150	135
1996	1,013	11,108	54,792	35,375	11,915	18,089	10,711	7,647	5,108	3,309	2,280	1,621	818	348	248	150	140	153	195	184	189	238	225	221	203	254	237	194	190	166
1997	2,155	38,024	64,878	24,185	37,692	16,804	11,525	7,453	4,892	3,606	2,438	1,210	494	310	198	162	214	272	254	295	356	328	325	300	367	259	266	230	213	232
1998	3,870	20,475	12,081	20,312	10,170	7,010	4,551	3,049	2,104	1,486	748	300	161	122	93	131	131	120	136	164	151	168	139	186	137	137	113	120	101	118
1999	613	2,829	19,267	11,945	7,514	4,410	3,421	2,427	1,726	795	268	165	90	81	112	121	117	153	143	138	136	136	130	110	106	104	99	78	76	81
2000	579	18,880	13,051	9,077	5,382	4,397	3,193	2,301	1,062	344	214	85	118	167	159	167	210	193	217	194	172	199	129	108	109	91	86	96	95	92
2001	984	5,165	5,823	3,745	3,305	2,246	1,500	577	203	98	64	59	78	94	97	90	129	110	95	77	83	69	65	50	50	33	36	44	49	38
2002	2,558	23,137	14,155	13,413	9,528	6,533	2,523	722	365	209	187	302	294	351	345	379	426	376	304	361	250	218	184	131	186	155	143	140	146	142
2003	4,113	11,086	12,776	9,107	5,769	2,314	611	347	174	147	259	236	298	352	392	345	351	225	268	192	165	152	117	131	127	100	106	109	108	86
2004	5,188	22,141	19,507	13,402	5,201	1,425	681	323	331	532	570	670	766	834	839	756	586	635	510	407	380	344	302	290	280	263	226	221	210	199
2005	3,335	8,303	7,812	4,779	1,275	585	268	283	541	524	628	750	806	836	801	559	532	385	335	292	275	252	215	234	228	210	171	188	163	138
2006	329	1,253	1,447	884	266	88	101	191	142	157	191	211	219	206	169	148	93	96	77	64	65	76	57	55	57	54	42	37	54	44
2007	96	517	711	354	96	92	126	49	72	70	95	82	72	60	58	55	48	28	39	25	20	30	24	26	26	25	22	21	24	17
2008	131	2,820	1,462	775	612	690	215	211	203	200	198	182	145	139	112	107	95	79	49	46	66	53	37	48	55	50	36	45	29	27
2009	1,476	2,048	1,318	826	1,114	494	425	397	394	443	401	287	314	241	180	140	132	98	88	76	76	85	69	47	50	43	37	30	42	30
2010	1,228	3,556	2,852	5,280	4,337	4,277	2,842	2,503	2,238	2,089	1,466	1,517	1,035	852	601	514	494	458	383	346	287	250	222	200	190	159	147	122	109	105
2011	606	4,165	7,685	6,196	6,494	4,936	3,062	2,472	2,275	1,573	1,493	1,024	736	620	470	511	398	363	307	286	231	205	168	155	134	113	103	103	101	67
2012	542	3,055	2,958	3,017	2,481	1,721	1,042	947	612	600	373	296	217	172	180	129	119	140	92	96	80	66	46	49	53	41	40	35	38	26
2013	257	1,186	1,624	1,466	1,146	799	613	399	318	224	151	119	79	62	68	66	57	57	43	43	30	43	28	23	27	15	11	16	10	11
2014	684	5,418	3,999	2,467	1,601	1,347	867	522	325	243	168	145	117	92	94	86	67	66	70	56	49	36	28	37	35	34	30	20	24	22
2015	1,055	2,825	2,361	1,633	1,215	1,044	586	374	229	183	118	120	89	74	72	72	54	51	38	42	39	25	19	23	19	23	18	16	11	12
2016	354	867	722	570	612	356	242	160	124	92	67	49	56	40	33	25	22	23	19	16	10	9	13	12	5	5	3	8	5	7
2017	51	521	556	759	462	282	204	139	128	85	72	64	47	34	40	32	30	25	19	20	15	21	15	11	7	11	5	3	6	6
2018	96	600	923	558	297	219	139	133	98	64	74	61	32	39	38	30	23	26	21	27	19	15	13	13	8	8	9	4	5	8
2019	232	1,080	595	329	231	158	98	82	89	53	41	27	25	17	23	26	16	21	13	14	18	3	8	9	4	3	6	5	3	7
2020	30	117	51	39	16	13	16	9	8	5	1	1	6	2	1	2	2	0	1	1	0	1	1	0	0	1	1	0	0	0

Table 7: Non-Claim Termination Rate = Table 6 / Table 1
Percentage of Active Loans at the Beginnng of the Evaluation Year that end in Termination by Other Than Claim During the Evaluation Year

	Evaluation Year																												
Fiscal Year	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	0.11%	1.87%	5.72%	11.08%	13.77%	9.32%	14.69%	13.27%	21.32%	20.69%	15.15%	24.11%	26.54%	28.39%	23.15%	17.20%	21.54%	13.13%	7.43%	6.88%	4.44%	4.06%	3.92%	4.40%	3.61%	7.94%	5.36%	7.44%	13.27%	19.65%
1991	0.12%	1.65%	6.47%	9.79%	7.92%	14.11%	13.80%	22.20%	23.93%	14.80%	26.85%	31.75%	34.79%	27.30%	19.70%	24.63%	16.84%	9.83%	8.20%	4.38%	3.88%	3.66%	4.49%	4.36%	5.13%	6.48%	7.88%	10.61%	9.60%	16.72%
1992	0.24%	3.43%	7.89%	8.22%	15.94%	14.43%	25.63%	26.09%	15.87%	27.31%	31.69%	36.29%	26.53%	20.67%	20.00%	17.78%	12.67%	6.47%	5.54%	4.41%	4.30%	5.20%	5.42%	6.61%	7.51%	7.72%	10.33%	12.81%	11.82%	11.85%
1993	0.66%	4.47%	6.45%	15.06%	13.16%	25.09%	26.10%	15.50%	32.82%	35.53%	41.25%	31.67%	24.08%	21.19%	19.01%	11.69%	7.17%	5.12%	3.94%	3.84%	4.38%	5.06%	5.83%	7.22%	7.65%	8.97%	11.97%	10.57%	11.64%	11.30%
1994	0.65%	3.41%	12.04%	13.15%	26.40%	25.49%	15.17%	31.53%	34.53%	41.40%	33.37%	26.10%	23.17%	20.02%	12.41%	6.48%	4.68%	3.80%	3.45%	4.19%	4.78%	5.70%	6.70%	7.64%	9.10%	9.33%	7.79%	10.62%	9.99%	9.94%
1995	1.31%	9.46%	17.32%	47.99%	32.54%	16.47%	34.17%	34.89%	38.19%	33.78%	30.02%	26.90%	21.16%	11.98%	5.21%	3.69%	2.86%	2.57%	3.86%	3.65%	4.33%	5.09%	5.39%	8.14%	8.08%	7.61%	8.70%	7.45%	8.94%	9.40%
1996	0.55%	6.45%	47.75%	46.93%	19.65%	44.22%	36.90%	37.48%	34.49%	29.34%	25.76%	22.69%	13.16%	6.02%	4.56%	2.87%	2.80%	3.21%	4.32%	4.33%	4.75%	6.45%	6.53%	6.90%	6.79%	9.32%	9.54%	8.49%	9.10%	9.17%
1997	0.90%	19.04%	49.38%	23.44%	60.26%	38.57%	38.02%	33.84%	29.28%	28.06%	23.82%	13.65%	6.01%	4.00%	2.67%	2.27%	3.15%	4.23%	4.19%	5.22%	6.81%	6.75%	7.21%	7.15%	9.65%	7.35%	8.20%	7.68%	7.70%	9.53%
1998	4.17%	28.55%	20.76%	55.56%	40.19%	40.17%	36.64%	33.39%	30.59%	28.07%	16.79%	7.38%	4.21%	3.35%	2.68%	4.02%	4.26%	4.12%	5.01%	6.51%	6.44%	7.77%	6.88%	10.19%	8.14%	8.90%	7.95%	9.25%	8.51%	12.04%
1999	0.99%	4.81%	49.38%	45.42%	42.10%	34.18%	37.17%	36.63%	36.00%	20.31%	7.55%	5.02%	2.88%	2.74%	4.06%	4.69%	4.85%	6.89%	7.01%	7.34%	7.84%	8.53%	8.95%	8.24%	8.67%	9.34%	9.76%	8.40%	8.95%	10.71%
2000	0.87%	39.69%	38.69%	38.56%	30.87%	34.96%	35.11%	35.00%	20.06%	7.20%	4.85%	2.02%	2.98%	4.57%	4.66%	5.26%	7.22%	7.27%	8.99%	8.82%	8.51%	11.02%	7.73%	6.96%	7.59%	6.77%	6.88%	8.38%	9.08%	10.19%
2001	3.74%	24.48%	38.91%	34.31%	44.62%	44.81%	44.29%	21.32%	8.54%	4.49%	3.14%	3.07%	4.40%	5.75%	6.44%	6.50%	10.40%	9.80%	9.30%	8.17%	9.70%	8.85%	9.14%	7.61%	8.25%	5.79%	6.77%	9.03%	11.29%	10.64%
2002	3.06%	38.42%	31.39%	43.56%	46.48%	48.96%	24.76%	8.08%	4.52%	2.78%	2.67%	4.72%	4.98%	6.51%	7.04%	8.54%	10.74%	10.55%	9.36%	12.59%	9.59%	9.19%	8.47%	6.44%	10.11%	9.21%	9.32%	10.04%	11.79%	13.22%
2003	7.89%	27.20%	46.76%	51.71%	51.13%	27.59%	8.35%	5.30%	2.86%	2.60%	5.05%	4.99%	6.87%	9.04%	11.42%	11.30%	13.08%	9.19%	12.42%	9.83%	9.27%	9.39%	7.82%	9.62%	10.31%	8.90%	10.43%	12.08%	13.64%	13.23%
2004	6.07%	35.32%	46.51%	49.36%	25.45%	8.05%	4.25%	2.15%	2.38%	4.19%	4.88%	6.26%	7.92%	9.61%	10.85%	10.93%	9.29%	11.29%	10.00%	8.71%	8.90%	8.81%	8.41%	8.82%	9.36%	9.68%	9.09%	9.78%	10.35%	12.59%
2005	7.70%	24.04%	30.34%	24.31%	7.44%	3.78%	1.86%	2.10%	4.44%	4.69%	6.21%	8.25%	9.94%	11.69%	12.74%	9.82%	10.41%	8.20%	7.73%	7.27%	7.41%	7.31%	6.70%	7.91%	8.40%	8.44%	7.40%	8.87%	8.35%	8.70%
2006	3.35%	14.85%	21.65%	16.51%	5.75%	2.08%	2.62%	5.54%	4.52%	5.47%	7.44%	9.20%	10.76%	11.44%	10.43%	10.14%	6.87%	7.69%	6.61%	5.84%	6.35%	8.08%	6.45%	6.67%	7.52%	7.71%	6.40%	5.98%	9.56%	10.81%
2007	2.14%	13.23%	23.69%	14.93%	4.60%	5.04%	8.12%	3.44%	5.56%	6.01%	9.30%	8.97%	8.78%	7.93%	8.41%	8.76%	8.33%	5.17%	7.77%	5.30%	4.47%	7.21%	6.15%	7.20%	7.83%	8.20%	7.80%	8.05%	10.34%	8.81%
2008	1.09%	30.84%	20.07%	12.92%	12.44%	18.54%	6.90%	7.80%	8.59%	9.71%	10.92%	11.40%	10.06%	10.85%	9.63%	10.20%	10.03%	9.18%	6.09%	6.11%	9.64%	8.45%	6.32%	8.96%	11.48%	11.71%	9.21%	13.01%	9.21%	9.93%
2009	11.40%	19.05%	14.49%	10.51%	18.00%	9.39%	9.28%	10.02%	11.48%	15.23%	16.31%	13.43%	17.54%	15.75%	13.45%	11.77%	12.57%	10.37%	10.38%	9.92%	11.09%	14.29%	13.22%	9.89%	11.79%	11.29%	10.79%	9.62%	15.61%	14.56%
2010	2.68%	8.48%	7.41%	16.41%	16.20%	19.65%	15.49%	16.17%	17.24%	19.47%	15.95%	19.96%	15.88%	15.13%	12.01%	11.53%	12.53%	13.19%	12.46%	12.72%	11.83%	11.51%	11.42%	11.50%	12.29%	11.48%	11.87%	10.93%	10.85%	12.61%
2011	1.20%	9.07%	20.38%	20.03%	27.16%	26.53%	20.07%	19.63%	22.29%	18.31%	21.28%	17.18%	14.18%	13.67%	11.62%	14.51%	12.79%	13.26%	12.66%	13.38%	12.16%	12.17%	11.11%	11.45%	11.05%	10.28%	10.34%	11.53%	12.80%	9.99%
2012	2.74%	18.34%	21.83%	29.00%	31.88%	28.88%	21.53%	24.63%	19.02%	23.32%	17.16%	15.92%	13.29%	11.85%	14.23%	11.42%	11.83%	16.22%	11.98%	14.35%	13.61%	12.67%	9.70%	11.56%	14.29%	12.42%	13.84%	13.78%	17.59%	15.66%
2013	2.84%	15.10%	26.21%	31.30%	32.71%	29.95%	30.17%	24.57%	24.61%	21.21%	16.83%	15.45%	11.53%	10.02%	12.41%	13.72%	13.48%	15.62%	13.40%	15.58%	12.20%	21.18%	16.09%	15.44%	22.13%	14.02%	11.46%	20.00%	14.29%	19.64%
2014	3.67%	41.07%	43.75%	37.39%	32.36%	37.91%	32.58%	24.99%	18.65%	16.40%	12.95%	12.72%	11.55%	10.07%	11.48%	11.75%	10.08%	11.06%	13.28%	11.91%	11.64%	9.38%	7.89%	11.64%	12.37%	13.65%	13.70%	10.05%	13.79%	15.60%
2015	9.01%	31.85%	36.49%	33.97%	34.07%	41.69%	31.22%	25.20%	18.47%	17.51%	12.84%	15.13%	12.71%	11.84%	13.07%	15.09%	12.86%	13.82%	11.48%	14.63%	15.92%	11.36%	9.45%	12.99%	12.03%	17.04%	15.38%	16.00%	12.36%	16.90%
2016	8.24%	25.29%	26.75%	26.92%	40.80%	31.56%	27.63%	22.57%	21.49%	19.17%	16.30%	13.61%	18.54%	15.33%	14.67%	12.69%	12.64%	15.23%	14.50%	13.91%	9.52%	9.47%	15.85%	17.14%	7.69%	8.33%	5.26%	16.33%	11.36%	23.33%
2017	1.36%	16.17%	20.89%	40.01%	32.95%	25.43%	22.77%	18.58%	20.95%	16.22%	16.11%	16.71%	14.11%	11.37%	15.56%	14.29%	15.54%	14.97%	12.84%	15.63%	13.27%	22.83%	19.48%	16.67%	11.86%	23.40%	11.90%	7.69%	18.18%	22.22%
2018	2.59%	19.36%	42.55%	35.41%	23.59%	21.58%	16.20%	18.79%	16.50%	12.28%	16.63%	15.97%	9.14%	12.66%	14.13%	12.61%	10.70%	13.83%	12.57%	19.29%	15.70%	14.15%	13.98%	16.25%	11.11%	12.50%	16.67%	8.00%	11.11%	23.53%
2019	7.30%	51.55%	40.61%	29.56%	26.77%	22.97%	17.19%	16.91%	22.94%	16.01%	14.29%	10.55%	10.87%	8.02%	12.23%	16.15%	11.03%	16.94%	11.71%	14.43%	22.78%	3.95%	11.76%	15.25%	7.27%	5.77%	13.33%	12.50%	8.11%	28.00%
2020	9.55%	60.94%	36.96%	40.63%	20.51%	20.97%	34.78%	24.32%	27.59%	20.83%	4.35%	4.55%	37.50%	14.29%	8.33%	22.22%	28.57%	0.00%	16.67%	20.00%	0.00%	25.00%	33.33%	0.00%	0.00%	50.00%	100.00%	0.00%	0.00%	0.00%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Cumulative Non-Claim Termination Rate
ARM

Table 8: Cumulative Number of Non-ClaimTerminations as of Each Evaluation Year
Total Number of Non-Claim Terminations for each Fiscal Year as of the End of the Evaluation Year

	Evaluation Year																													
Fiscal Year	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	31
1990	7	128	475	1,073	1,717	2,111	2,643	3,059	3,600	4,030	4,300	4,644	4,942	5,189	5,352	5,455	5,561	5,618	5,648	5,674	5,690	5,704	5,717	5,731	5,742	5,764	5,778	5,796	5,824	5,858	5,858
1991	35	511	2,249	4,623	6,380	9,083	11,360	14,298	16,811	18,144	20,034	21,721	23,086	23,923	24,426	24,929	25,223	25,379	25,499	25,560	25,612	25,659	25,714	25,765	25,822	25,889	25,964	26,055	26,130	26,240	26,240
1992	221	3,231	9,606	15,680	25,702	33,471	44,234	52,775	57,192	63,116	68,303	72,634	75,126	76,731	78,022	78,995	79,609	79,902	80,139	80,319	80,487	80,679	80,868	81,083	81,309	81,524	81,784	82,069	82,304	82,512	82,514
1993	758	5,650	12,237	25,438	35,397	50,234	62,227	68,292	77,866	85,456	91,642	95,230	97,421	99,008	100,200	100,854	101,227	101,479	101,665	101,839	102,028	102,235	102,459	102,716	102,968	103,238	103,559	103,815	104,067	104,272	104,273
1994	1,176	7,132	25,736	43,298	70,465	90,833	101,152	117,275	130,272	141,186	147,734	151,778	154,682	156,767	157,912	158,471	158,854	159,152	159,412	159,713	160,039	160,405	160,806	161,229	161,689	162,119	162,452	162,861	163,209	163,502	163,504
1995	1,622	12,252	28,565	58,176	72,702	78,811	88,054	94,911	100,211	103,650	105,973	107,596	108,643	109,168	109,383	109,528	109,636	109,730	109,864	109,985	110,121	110,271	110,420	110,626	110,814	110,978	111,150	111,287	111,437	111,572	111,575
1996	1,013	12,121	66,913	102,288	114,203	132,292	143,003	150,650	155,758	159,067	161,347	162,968	163,786	164,134	164,382	164,532	164,672	164,825	165,020	165,204	165,393	165,631	165,856	166,077	166,280	166,534	166,771	166,965	167,155	167,321	167,321
1997	2,155	40,179	105,057	129,242	166,934	183,738	195,263	202,716	207,608	211,214	213,652	214,862	215,356	215,666	215,864	216,026	216,240	216,512	216,766	217,061	217,417	217,745	218,070	218,370	218,737	218,996	219,262	219,492	219,705	219,937	219,939
1998	3,870	24,345	36,426	56,738	66,908	73,918	78,469	81,518	83,622	85,108	85,856	86,156	86,317	86,439	86,532	86,663	86,794	86,914	87,050	87,214	87,365	87,533	87,672	87,858	87,995	88,132	88,245	88,365	88,466	88,584	88,584
1999	613	3,442	22,709	34,654	42,168	46,578	49,999	52,426	54,152	54,947	55,215	55,380	55,470	55,551	55,663	55,784	55,901	56,054	56,197	56,335	56,471	56,607	56,737	56,847	56,953	57,057	57,156	57,234	57,310	57,391	57,393
2000	579	19,459	32,510	41,587	46,969	51,366	54,559	56,860	57,922	58,266	58,480	58,565	58,683	58,850	59,009	59,176	59,386	59,579	59,796	59,990	60,162	60,361	60,490	60,598	60,707	60,798	60,884	60,980	61,075	61,167	61,169
2001	984	6,149	11,972	15,717	19,022	21,268	22,768	23,345	23,548	23,646	23,710	23,769	23,847	23,941	24,038	24,128	24,257	24,367	24,462	24,539	24,622	24,691	24,756	24,806	24,856	24,889	24,925	24,969	25,018	25,056	25,056
2002	2,558	25,695	39,850	53,263	62,791	69,324	71,847	72,569	72,934	73,143	73,330	73,632	73,926	74,277	74,622	75,001	75,427	75,803	76,107	76,468	76,718	76,936	77,120	77,251	77,437	77,592	77,735	77,875	78,021	78,163	78,163
2003	4,113	15,199	27,975	37,082	42,851	45,165	45,776	46,123	46,297	46,444	46,703	46,939	47,237	47,589	47,981	48,326	48,677	48,902	49,170	49,362	49,527	49,679	49,796	49,927	50,054	50,154	50,260	50,369	50,477	50,563	50,564
2004	5,188	27,329	46,836	60,238	65,439	66,864	67,545	67,868	68,199	68,731	69,301	69,971	70,737	71,571	72,410	73,166	73,752	74,387	74,897	75,304	75,684	76,028	76,330	76,620	76,900	77,163	77,389	77,610	77,820	78,019	78,021
2005	3,335	11,638	19,450	24,229	25,504	26,089	26,357	26,640	27,181	27,705	28,333	29,083	29,889	30,725	31,526	32,085	32,617	33,002	33,337	33,629	33,904	34,156	34,371	34,605	34,833	35,043	35,214	35,402	35,565	35,703	35,703
2006	329	1,582	3,029	3,913	4,179	4,267	4,368	4,559	4,701	4,858	5,049	5,260	5,479	5,685	5,854	6,002	6,095	6,191	6,268	6,332	6,397	6,473	6,530	6,585	6,642	6,696	6,738	6,775	6,829	6,873	6,873
2007	96	613	1,324	1,678	1,774	1,866	1,992	2,041	2,113	2,183	2,278	2,360	2,432	2,492	2,550	2,605	2,653	2,681	2,720	2,745	2,765	2,795	2,819	2,845	2,871	2,896	2,918	2,939	2,963	2,980	2,981
2008	131	2,951	4,413	5,188	5,800	6,490	6,705	6,916	7,119	7,319	7,517	7,699	7,844	7,983	8,095	8,202	8,297	8,376	8,425	8,471	8,537	8,590	8,627	8,675	8,730	8,780	8,816	8,861	8,890	8,917	8,917
2009	1,476	3,524	4,842	5,668	6,782	7,276	7,701	8,098	8,492	8,935	9,336	9,623	9,937	10,178	10,358	10,498	10,630	10,728	10,816	10,892	10,968	11,053	11,122	11,169	11,219	11,262	11,299	11,329	11,371	11,401	11,401
2010	1,228	4,784	7,636	12,916	17,253	21,530	24,372	26,875	29,113	31,202	32,668	34,185	35,220	36,072	36,673	37,187	37,681	38,139	38,522	38,868	39,155	39,405	39,627	39,827	40,017	40,176	40,323	40,445	40,554	40,659	40,659
2011	606	4,771	12,456	18,652	25,146	30,082	33,144	35,616	37,891	39,464	40,957	41,981	42,717	43,337	43,807	44,318	44,716	45,079	45,386	45,672	45,903	46,108	46,276	46,431	46,565	46,678	46,781	46,884	46,985	47,052	47,052
2012	542	3,597	6,555	9,572	12,053	13,774	14,816	15,763	16,375	16,975	17,348	17,644	17,861	18,033	18,213	18,342	18,461	18,601	18,693	18,789	18,869	18,935	18,981	19,030	19,083	19,124	19,164	19,199	19,237	19,263	19,264
2013	257	1,443	3,067	4,533	5,679	6,478	7,091	7,490	7,808	8,032	8,183	8,302	8,381	8,443	8,511	8,577	8,634	8,691	8,734	8,777	8,807	8,850	8,878	8,901	8,928	8,943	8,954	8,970	8,980	8,991	8,991
2014	684	6,102	10,101	12,568	14,169	15,516	16,383	16,905	17,230	17,473	17,641	17,786	17,903	17,995	18,089	18,175	18,242	18,308	18,378	18,434	18,483	18,519	18,547	18,584	18,619	18,653	18,683	18,703	18,727	18,749	18,749
2015	1,055	3,880	6,241	7,874	9,089	10,133	10,719	11,093	11,322	11,505	11,623	11,743	11,832	11,906	11,978	12,050	12,104	12,155	12,193	12,235	12,274	12,299	12,318	12,341	12,360	12,383	12,401	12,417	12,428	12,440	12,440
2016	354	1,221	1,943	2,513	3,125	3,481	3,723	3,883	4,007	4,099	4,166	4,215	4,271	4,311	4,344	4,369	4,391	4,414	4,433	4,449	4,459	4,468	4,481	4,493	4,498	4,503	4,506	4,514	4,519	4,526	4,526
2017	51	572	1,128	1,887	2,349	2,631	2,835	2,974	3,102	3,187	3,259	3,323	3,370	3,404	3,444	3,476	3,506	3,531	3,550	3,570	3,585	3,606	3,621	3,632	3,639	3,650	3,655	3,658	3,664	3,670	3,670
2018	96	696	1,619	2,177	2,474	2,693	2,832	2,965	3,063	3,127	3,201	3,262	3,294	3,333	3,371	3,401	3,424	3,450	3,471	3,498	3,517	3,532	3,545	3,558	3,566	3,574	3,583	3,587	3,592	3,600	3,600
2019	232	1,312	1,907	2,236	2,467	2,625	2,723	2,805	2,894	2,947	2,988	3,015	3,040	3,057	3,080	3,106	3,122	3,143	3,156	3,170	3,188	3,191	3,199	3,208	3,212	3,215	3,221	3,226	3,229	3,236	3,236
2020	30	147	198	237	253	266	282	291	299	304	305	306	312	314	315	317	319	319	320	321	321	322	323	323	323	324	325	325	325	325	325

Table 9: Cumulative Non-Claim Termination Rate = Table 8 / Table 1 (Evaluation Year 1)
Cumulative Non-Claim Terminations as of Evaluation Year Divided by Active Loans as of Evaluation Year 1

	Evaluation Year																													
Fiscal Year	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	31
1990	0.11%	1.94%	7.21%	16.28%	26.06%	32.04%	40.11%	46.43%	54.64%	61.16%	65.26%	70.48%	75.00%	78.75%	81.23%	82.79%	84.40%	85.26%	85.72%	86.11%	86.36%	86.57%	86.77%	86.98%	87.15%	87.48%	87.69%	87.96%	88.39%	88.91%	88.91%
1991	0.12%	1.75%	7.68%	15.79%	21.79%	31.03%	38.80%	48.84%	57.42%	61.98%	68.43%	74.19%	78.86%	81.72%	83.43%	85.15%	86.16%	86.69%	87.10%	87.31%	87.48%	87.65%	87.83%	88.01%	88.20%	88.43%	88.69%	89.00%	89.25%	89.63%	89.63%
1992	0.24%	3.56%	10.58%	17.26%	28.30%	36.85%	48.70%	58.10%	62.97%	69.49%	75.20%	79.97%	82.71%	84.48%	85.90%	86.97%	87.65%	87.97%	88.23%	88.43%	88.62%	88.83%	89.04%	89.27%	89.52%	89.76%	90.04%	90.36%	90.62%	90.85%	90.85%
1993	0.66%	4.93%	10.67%	22.19%	30.87%	43.81%	54.27%	59.56%	67.91%	74.53%	79.93%	83.06%	84.97%	86.35%	87.39%	87.96%	88.29%	88.51%	88.67%	88.82%	88.99%	89.17%	89.36%	89.59%	89.81%	90.04%	90.32%	90.55%	90.77%	90.94%	90.95%
1994	0.65%	3.94%	14.20%	23.89%	38.88%	50.12%	55.81%	64.71%	71.88%	77.90%	81.52%	83.75%	85.35%	86.50%	87.13%	87.44%	87.65%	87.82%	87.96%	88.13%	88.31%	88.51%	88.73%	88.96%	89.22%	89.45%	89.64%	89.86%	90.05%	90.22%	90.22%
1995	1.31%	9.93%	23.15%	47.16%	58.93%	63.88%	71.38%	76.94%	81.23%	84.02%	85.90%	87.22%	88.07%	88.49%	88.67%	88.78%	88.87%	88.95%	89.06%	89.15%	89.26%	89.39%	89.51%	89.67%	89.83%	89.96%	90.10%	90.21%	90.33%	90.44%	90.44%
1996	0.55%	6.59%	36.39%	55.62%	62.10%	71.94%	77.76%	81.92%	84.70%	86.50%	87.74%	88.62%	89.07%	89.26%	89.39%	89.47%	89.55%	89.63%	89.74%	89.84%	89.94%	90.07%	90.19%	90.31%	90.42%	90.56%	90.69%	90.79%	90.90%	90.99%	90.99%
1997	0.90%	16.84%	44.03%	54.17%	69.97%	77.01%	81.84%	84.97%	87.02%	88.53%	89.55%	90.06%	90.27%	90.40%	90.48%	90.55%	90.64%	90.75%	90.86%	90.98%	91.13%	91.27%	91.40%	91.53%	91.68%	91.79%	91.90%	92.00%	92.09%	92.19%	92.19%
1998	4.17%	26.22%	39.23%	61.11%	72.06%	79.61%	84.51%	87.79%	90.06%	91.66%	92.47%	92.79%	92.96%	93.09%	93.19%	93.34%	93.48%	93.61%	93.75%	93.93%	94.09%	94.27%	94.42%	94.62%	94.77%	94.92%	95.04%	95.17%	95.28%	95.40%	95.40%
1999	0.99%	5.58%	36.79%	56.14%	68.32%	75.46%	81.00%	84.93%	87.73%	89.02%	89.45%	89.72%	89.87%	90.00%	90.18%	90.38%	90.56%	90.81%	91.04%	91.27%	91.49%	91.71%	91.92%	92.10%	92.27%	92.44%	92.60%	92.72%	92.85%	92.98%	92.98%
2000	0.87%	29.17%	48.73%	62.34%	70.40%	76.99%	81.78%	85.23%	86.82%	87.34%	87.66%	87.78%	87.96%	88.21%	88.45%	88.70%	89.01%	89.30%	89.63%	89.92%	90.18%	90.48%	90.67%	90.83%	90.99%	91.13%	91.26%	91.40%	91.55%	91.68%	91.69%
2001	3.74%	23.36%	45.49%	59.72%	72.27%	80.81%	86.50%	88.70%	89.47%	89.84%	90.08%	90.31%	90.60%	90.96%	91.33%	91.67%	92.16%	92.58%	92.94%	93.23%	93.55%	93.81%	94.06%	94.25%	94.44%	94.56%	94.70%	94.87%	95.05%	95.20%	95.20%
2002	3.06%	30.75%	47.68%	63.73%	75.13%	82.95%	85.97%	86.84%	87.27%	87.52%	87.75%	88.11%	88.46%	88.88%	89.29%	89.75%	90.25%	90.70%	91.07%	91.50%	91.80%	92.06%	92.28%	92.44%	92.66%	92.85%	93.02%	93.18%	93.36%	93.53%	93.53%
2003	7.89%	29.16%	53.68%	71.15%	82.22%	86.66%	87.83%	88.50%	88.83%	89.11%	89.61%	90.06%	90.64%	91.31%	92.06%	92.73%	93.40%	93.83%	94.35%	94.71%	95.03%	95.32%	95.55%	95.80%	96.04%	96.23%	96.44%	96.65%	96.85%	97.02%	97.02%
2004	6.07%	31.98%	54.80%	70.49%	76.57%	78.24%	79.04%	79.41%	79.80%	80.42%	81.09%	81.88%	82.77%	83.75%	84.73%	85.61%	86.30%	87.04%	87.64%	88.12%	88.56%	88.96%	89.32%	89.66%	89.98%	90.29%	90.56%	90.81%	91.06%	91.29%	91.30%
2005	7.70%	26.88%	44.92%	55.96%	58.90%	60.25%	60.87%	61.53%	62.78%	63.99%	65.44%	67.17%	69.03%	70.96%	72.81%	74.10%	75.33%	76.22%	76.99%	77.67%	78.30%	78.89%	79.38%	79.92%	80.45%	80.93%	81.33%	81.76%	82.14%	82.46%	82.46%
2006	3.35%	16.11%	30.84%	39.84%	42.55%	43.44%	44.47%	46.42%	47.86%	49.46%	51.41%	53.55%	55.78%	57.88%	59.60%	61.11%	62.05%	63.03%	63.82%	64.47%	65.13%	65.90%	66.48%	67.04%	67.62%	68.17%	68.60%	68.98%	69.53%	69.98%	69.98%
2007	2.14%	13.67%	29.53%	37.42%	39.56%	41.61%	44.42%	45.52%	47.12%	48.68%	50.80%	52.63%	54.24%	55.58%	56.87%	58.10%	59.17%	59.79%	60.66%	61.22%	61.66%	62.33%	62.87%	63.45%	64.03%	64.59%	65.08%	65.54%	66.08%	66.46%	66.48%
2008	1.09%	24.48%	36.60%	43.03%	48.10%	53.83%	55.61%	57.36%	59.04%	60.70%	62.35%	63.86%	65.06%	66.21%	67.14%	68.03%	68.81%	69.47%	69.88%	70.26%	70.81%	71.24%	71.55%	71.95%	72.41%	72.82%	73.12%	73.49%	73.73%	73.96%	73.96%
2009	11.40%	27.21%	37.39%	43.77%	52.37%	56.19%	59.47%	62.53%	65.58%	69.00%	72.09%	74.31%	76.73%	78.59%	79.98%	81.07%	82.08%	82.84%	83.52%	84.11%	84.69%	85.35%	85.88%	86.25%	86.63%	86.97%	87.25%	87.48%	87.81%	88.04%	88.04%
2010	2.68%	10.46%	16.69%	28.23%	37.71%	47.06%	53.27%	58.74%	63.64%	68.20%	71.41%	74.72%	76.99%	78.85%	80.16%	81.28%	82.36%	83.37%	84.20%	84.96%	85.59%	86.13%	86.62%	87.06%	87.47%	87.82%	88.14%	88.41%	88.64%	88.87%	88.87%
2011	1.20%	9.49%	24.76%	37.08%	49.99%	59.81%	65.90%	70.81%	75.33%	78.46%	81.43%	83.46%	84.93%	86.16%	87.09%	88.11%	88.90%	89.62%	90.23%	90.80%	91.26%	91.67%	92.00%	92.31%	92.58%	92.80%	93.01%	93.21%	93.41%	93.55%	93.55%
2012	2.74%	18.16%	33.09%	48.31%	60.84%	69.52%	74.78%	79.56%	82.65%	85.68%	87.56%	89.06%	90.15%	91.02%	91.93%	92.58%	93.18%	93.89%	94.35%	94.84%	95.24%	95.57%	95.81%	96.05%	96.32%	96.53%	96.73%	96.91%	97.10%	97.23%	97.23%
2013	2.84%	15.94%	33.87%	50.06%	62.72%	71.54%	78.31%	82.72%	86.23%	88.70%	90.37%	91.68%	92.56%	93.24%	93.99%	94.72%	95.35%	95.98%	96.45%	96.93%	97.26%	97.74%	98.05%	98.30%	98.60%	98.76%	98.88%	99.06%	99.17%	99.29%	99.29%
2014	3.67%	32.75%	54.22%	67.46%	76.05%	83.29%	87.94%	90.74%	92.49%	93.79%	94.69%	95.47%	96.10%	96.59%	97.10%	97.56%	97.92%	98.27%	98.65%	98.95%	99.21%	99.40%	99.55%	99.75%	99.94%	100.12%	100.28%	100.39%	100.52%	100.64%	100.64%
2015	9.01%	33.15%	53.32%	67.27%	77.65%	86.57%	91.58%	94.77%	96.73%	98.29%	99.30%	100.32%	101.09%	101.72%	102.33%	102.95%	103.41%	103.84%	104.17%	104.53%	104.86%	105.07%	105.24%	105.43%	105.60%	105.79%	105.95%	106.08%	106.18%	106.28%	106.28%
2016	8.24%	28.42%	45.22%	58.48%	72.73%	81.01%	86.64%	90.37%	93.25%	95.39%	96.95%	98.09%	99.39%	100.33%	101.09%	101.68%	102.19%	102.72%	103.16%	103.54%	103.77%	103.98%	104.28%	104.56%	104.68%	104.79%	104.86%	105.05%	105.17%	105.33%	105.33%
2017	1.36%	15.27%	30.12%	50.39%	62.72%	70.25%	75.70%	79.41%	82.83%	85.10%	87.02%	88.73%	89.99%	90.89%	91.96%	92.82%	93.62%	94.29%	94.79%	95.33%	95.73%	96.29%	96.69%	96.98%	97.17%	97.46%	97.60%	97.68%	97.84%	98.00%	98.00%
2018	2.59%	18.78%	43.69%	58.74%	66.76%	72.67%	76.42%	80.01%	82.65%	84.38%	86.37%	88.02%	88.88%	89.94%	90.96%	91.77%	92.39%	93.09%	93.66%	94.39%	94.90%	95.30%	95.66%	96.01%	96.22%	96.44%	96.68%	96.79%	96.92%	97.14%	97.14%
2019	7.30%	41.30%	60.03%	70.38%	77.65%	82.63%	85.71%	88.29%	91.09%	92.76%	94.05%	94.90%	95.69%	96.22%	96.95%	97.77%	98.27%	98.93%	99.34%	99.78%	100.35%	100.44%	100.69%	100.98%	101.10%	101.20%	101.38%	101.54%	101.64%	101.86%	101.86%
2020	9.55%	46.82%	63.06%	75.48%	80.57%	84.71%	89.81%	92.68%	95.22%	96.82%	97.13%	97.45%	99.36%	100.00%	100.32%	100.96%	101.59%	101.59%	101.91%	102.23%	102.23%	102.55%	102.87%	102.87%	102.87%	103.18%	103.50%	103.50%	103.50%	103.50%	103.50%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Conditional Loss Rate
ARM

Table 10: Gross Claim Cost in Each Evaluation Year

	Evaluation Year																													
Fiscal Year	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	1,109,037	3,385,149	5,879,190	7,319,339	5,519,002	6,331,310	6,781,556	5,516,832	2,760,250	2,639,433	1,080,863	429,741	377,374	267,980	70,442	85,247	111,878	0	0	111,141	42,886	0	0	51,917	0	20,393	0	14,476	0
1991	71,157	2,143,037	14,962,806	23,250,835	28,041,777	29,576,062	36,636,796	32,677,974	21,321,455	14,196,057	7,156,032	3,102,329	1,803,724	1,811,631	707,597	590,021	115,307	185,326	217,041	481,571	119,075	557,455	290,576	78,763	121,313	313,729	213,420	45,021	17,600	0
1992	79,894	10,202,714	48,214,657	72,250,400	97,026,446	122,691,477	102,860,581	67,561,678	44,855,419	19,782,013	11,424,613	8,353,467	3,900,722	1,689,993	1,356,529	772,462	690,091	1,454,903	998,645	757,272	841,541	1,154,355	833,971	840,521	1,134,615	333,873	315,199	220,180	0	0
1993	265,917	17,717,152	73,462,363	128,834,885	199,291,798	171,506,645	121,067,397	74,717,763	35,245,372	19,866,910	15,453,617	6,898,144	2,727,927	1,653,531	1,706,697	1,239,671	1,282,496	1,558,833	1,199,205	1,152,534	1,533,643	1,308,041	1,193,312	1,677,344	604,386	663,646	269,055	212,552	187,893	144,919
1994	535,940	34,188,751	170,094,412	335,538,492	354,453,938	262,560,012	158,762,627	78,539,979	45,319,367	32,202,709	15,570,056	6,430,339	4,867,403	2,770,103	2,767,445	2,427,492	3,790,043	3,307,906	2,239,497	3,606,126	2,371,242	1,960,669	2,203,120	1,610,584	932,711	460,604	91,444	548,638	369,153	62,554
1995	673,354	33,371,266	184,426,836	287,815,862	257,408,830	146,405,887	79,270,615	51,184,660	42,512,089	22,817,167	10,111,102	7,292,161	2,623,738	3,159,756	2,638,506	4,028,405	2,792,580	2,153,896	3,291,046	2,427,522	2,428,927	3,281,546	2,039,909	928,603	534,061	127,493	257,823	24,245	267,086	125,694
1996	302,438	53,293,766	278,765,735	420,109,158	291,754,900	170,359,111	115,223,493	92,512,862	42,438,134	20,095,225	12,102,853	6,855,709	8,858,310	6,894,098	6,939,036	6,595,407	5,247,243	6,144,064	4,171,303	5,376,473	5,673,168	2,923,259	1,117,077	1,246,618	180,641	515,375	193,379	156,046	75,478	135,545
1997	661,798	89,700,844	383,149,116	432,901,851	308,664,589	225,402,439	171,204,462	78,791,295	39,544,318	22,122,120	15,342,070	13,640,443	11,793,258	13,667,086	10,065,530	9,322,841	8,561,849	7,737,606	8,097,311	7,407,118	4,121,617	1,908,953	687,506	618,728	1,135,728	1,088,460	678,570	509,133	485,161	229,464
1998	1,301,992	78,227,070	170,388,656	147,093,495	112,784,157	90,431,700	47,271,414	23,923,425	13,994,376	8,739,571	7,822,076	7,042,694	7,053,955	5,370,474	6,763,907	5,896,367	3,634,797	3,593,634	4,915,719	1,626,351	1,024,979	250,896	136,500	471,747	306,565	222,330	100,639	171,389	111,567	7,296
1999	240,968	11,509,575	61,147,375	89,652,502	108,165,795	61,320,529	30,166,886	15,761,799	10,618,655	8,131,622	10,379,834	10,128,584	7,547,129	8,293,751	8,386,984	4,923,940	4,254,918	3,297,770	2,765,260	1,251,721	694,290	398,514	1,189,225	359,399	571,686	112,148	21,275	237,877	46,451	6,984
2000	77,444	32,119,454	90,436,664	128,557,361	83,928,327	50,359,735	32,560,053	23,451,869	22,677,243	18,219,008	16,146,464	12,737,501	12,141,795	13,711,274	8,382,955	5,840,115	5,402,060	4,257,116	1,248,268	817,262	431,515	900,361	571,180	542,566	394,464	22,936	430,161	373,169	176,708	70,092
2001	0	5,755,293	36,898,228	38,127,314	23,039,534	17,186,803	14,116,607	12,279,854	14,245,419	11,312,418	10,236,889	6,771,695	7,152,222	5,120,728	3,083,654	2,468,763	996,034	504,384	335,279	134,565	357,014	547,428	304,023	151,886	0	19,188	163,198	82,412	23,186	58,260
2002	33,295	21,661,072	124,048,819	113,191,978	94,507,788	76,536,238	80,332,488	66,611,667	58,586,198	42,083,924	40,197,571	34,314,451	21,722,589	16,444,842	13,886,996	5,613,213	3,177,163	1,683,398	625,099	1,743,387	776,961	1,264,889	901,120	667,526	573,035	74,223	164,521	191,728	415,559	4,595
2003	360,979	30,349,822	84,387,009	76,326,919	71,665,887	76,985,128	60,871,045	55,802,302	37,776,593	35,322,641	31,210,597	17,438,361	11,391,482	10,671,182	5,512,935	3,007,109	1,476,033	622,317	2,369,442	779,192	860,180	550,382	274,884	235,346	256,950	431,925	0	159,287	0	42,994
2004	5,585,737	78,063,581	156,117,979	182,986,687	210,150,690	178,302,797	135,890,235	93,716,248	95,095,802	91,544,952	54,546,037	36,354,368	30,815,294	14,654,760	9,237,711	4,738,452	1,758,916	4,544,166	1,236,967	1,493,577	1,552,594	1,225,888	844,685	1,288,855	1,157,083	835,259	395,607	286,792	614,765	9,104
2005	3,517,586	53,390,904	131,117,395	188,036,322	182,052,034	160,186,498	105,854,461	101,072,765	97,461,691	67,837,305	52,293,698	33,021,509	17,099,917	9,319,790	4,653,007	2,804,174	5,188,230	2,936,798	2,638,993	2,187,269	1,234,489	967,313	1,782,027	1,138,358	1,500,697	599,347	476,052	229,349	119,207	21,828
2006	350,879	18,410,902	44,915,086	68,694,803	73,573,781	45,955,527	43,124,755	31,520,038	23,562,561	17,122,576	14,697,611	6,200,149	4,099,146	1,658,841	1,067,574	1,794,437	1,268,262	897,108	624,123	611,815	492,521	656,286	0	168,825	810,013	234,332	64,705	0	0	172,720
2007	54,588	9,209,501	32,822,563	48,023,574	34,682,907	28,818,413	24,549,847	12,740,754	8,645,320	8,535,251	5,661,617	3,388,855	1,911,907	339,472	1,019,365	903,174	325,499	703,724	184,278	317,279	310,566	91,016	279,643	333,323	343,256	273,737	68,874	0	195,527	0
2008	25,302	15,722,722	73,409,582	98,086,285	83,201,098	90,552,179	75,987,052	38,160,682	23,078,057	15,949,224	6,004,780	3,188,284	847,328	3,473,204	1,042,829	1,037,345	842,412	768,177	917,928	640,127	182,462	695,507	618,334	48,077	368,196	145,256	0	0	145,674	0
2009	1,349,610	27,057,436	60,890,725	72,095,292	103,070,492	82,822,054	47,531,823	37,880,425	20,940,797	12,019,718	5,234,575	4,048,179	5,496,212	2,597,094	1,141,531	1,160,884	962,653	1,001,517	573,858	756,307	546,641	501,907	399,365	0	15,917	0	30,539	112,323	58,976	0
2010	1,815,964	31,855,339	90,734,931	173,219,153	189,088,493	124,437,264	99,969,517	48,813,326	34,054,815	19,179,395	8,832,885	11,954,307	5,927,074	3,654,189	3,101,985	3,031,009	2,368,620	1,614,584	2,000,410	831,282	1,197,230	665,167	665,198	364,078	162,332	440,857	0	0	137,076	111,663
2011	854,442	23,200,605	75,135,270	95,475,901	86,584,046	52,518,773	33,215,007	21,112,834	11,139,258	4,105,608	12,223,223	3,533,503	3,394,477	3,550,442	2,251,147	1,316,898	1,515,108	1,649,274	866,302	233,245	1,013,285	1,293,683	506,120	205,200	969,529	34,642	0	0	59,552	21,737
2012	745,107	10,891,817	21,995,035	18,014,395	19,072,108	13,833,285	9,711,600	6,572,020	2,320,324	7,584,756	3,920,038	2,883,762	1,075,988	768,857	1,119,291	287,251	320,491	308,204	437,930	483,959	180,317	31,832	168,793	92,851	0	0	39,677	0	0	0
2013	278,170	2,005,604	4,160,566	5,079,966	3,269,261	3,196,006	3,149,409	865,724	1,763,191	13,309,682	746,353	1,177,200	1,392,350	291,600	177,761	264,208	83,535	126,342	113,520	346,034	0	0	126,892	139,093	0	0	0	0	0	0
2014	0	2,099,424	4,611,453	10,698,397	4,260,895	4,260,746	3,141,528	7,649,545	2,762,334	2,766,126	1,949,416	1,686,242	1,255,819	835,000	38,511	368,914	0	296,100	0	39,207	0	85,819	40,998	0	0	0	0	0	42,169	43,716
2015	0	833,453	3,913,313	3,095,524	2,328,511	1,639,771	5,862,484	3,551,966	2,289,823	1,272,800	1,374,307	836,085	533,826	41,914	416,227	595,042	254,223	0	0	146,886	306,344	0	0	83,645	0	0	0	49,483	0	0
2016	0	104,778	484,367	1,761,820	345,309	3,144,279	1,025,148	1,070,526	1,010,085	675,599	320,165	328,812	192,787	71,675	360,295	169,661	184,820	0	51,356	0	0	83,419	0	0	0	0	0	0	0	0
2017	0	39,666	565,580	275,050	4,094,743	1,926,103	818,772	1,043,663	1,479,660	239,547	834,848	0	245,387	0	322,484	124,254	166,838	108,819	0	0	0	0	0	0	0	92,769	0	0	0	0
2018	0	502,979	492,654	17,164,404	3,673,506	3,476,030	2,763,860	2,622,570	2,739,911	1,515,483	155,077	104,815	0	338,784	194,242	196,120	0	109,169	0	0	0	0	0	0	0	0	22,485	0	0	0
2019	0	134,246	3,198,903	3,150,558	2,944,555	2,940,405	3,203,289	332,552	1,007,311	415,237	545,727	509,542	144,712	69,201	274,032	115,488	0	0	0	0	0	0	0	0	0	0	31,981	0	0	0
2020	0	795,582	279,409	418,725	522,946	146,498	0	0	0	0	0	0	0	0	181,024	74,605	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 11: Claim Cost Net of Recovery in Each Evaluation Year

	Evaluation Year																													
Fiscal Year	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	506,957	1,768,005	3,281,109	4,109,946	3,174,489	3,447,764	3,514,904	2,671,900	1,140,930	1,018,741	272,242	111,472	161,359	24,622	60,935	30,894	8,764	0	0	71,686	14,084	0	0	0	0	0	0	9,468	0
1991	0	1,106,186	8,385,005	12,207,472	14,742,322	15,552,743	17,955,701	15,487,470	9,116,110	5,257,781	2,346,547	1,138,718	383,743	495,938	246,320	270,282	67,346	157,428	146,775	379,609	99,206	316,495	129,527	0	9,104	149,525	54,567	0	0	0
1992	0	5,718,326	27,187,482	40,401,822	53,746,988	58,652,304	44,097,820	27,297,440	16,220,045	5,840,303	2,337,547	1,983,831	913,360	278,637	247,515	270,689	372,017	792,571	724,745	481,301	399,329	519,980	320,114	205,300	554,773	27,811	(44,419)	120,082	0	0
1993	58,273	9,520,962	41,776,469	69,842,377	97,071,857	71,864,265	44,974,335	25,947,020	9,167,359	4,651,140	3,279,958	1,638,122	975,145	729,864	984,362	749,303	632,826	1,116,320	755,986	537,071	689,659	552,542	401,073	706,967	181,641	346,201	44,098	189,515	90,147	79,052
1994	244,425	19,924,729	94,882,727	163,207,250	136,581,740	93,881,964	49,302,367	20,227,811	9,819,441	8,358,043	3,777,096	2,060,072	1,514,251	1,146,412	1,821,554	1,240,521	2,371,821	1,984,940	1,305,062	1,954,512	668,478	878,102	869,673	785,788	191,269	89,643	19,341	309,806	218,233	29,740
1995	228,984	19,858,637	87,482,387	111,658,640	91,630,048	49,988,452	23,124,057	12,537,020	12,606,227	6,623,678	3,213,018	2,237,371	1,590,664	1,735,628	1,634,606	2,533,068	1,713,630	1,284,151	1,922,790	1,180,811	1,370,667	1,704,804	912,223	437,694	277,778	36,104	161,738	11,977	158,679	90,346
1996	125,608	23,199,524	108,355,134	147,455,384	95,867,294	47,587,626	29,433,549	26,326,945	13,953,722	6,186,559	4,611,335	3,336,263	5,013,862	4,213,489	4,123,709	4,004,321	3,276,266	2,913,402	2,591,914	2,785,573	3,378,065	1,218,648	454,613	340,294	60,405	339,336	132,546	97,421	47,708	76,526
1997	224,473	38,605,627	148,568,058	144,623,172	90,289,993	59,358,310	50,189,349	23,505,858	12,451,370	7,520,793	6,854,282	7,891,215	6,993,484	8,866,107	6,711,432	5,484,568	5,412,032	3,982,033	4,382,628	4,521,685	2,112,172	1,016,566	121,559	401,603	675,347	627,751	398,269	377,018	260,920	136,154
1998	670,450	33,095,431	61,457,362	43,290,306	29,571,109	25,942,249	14,330,691	6,252,569	5,302,255	3,782,059	4,343,963	4,111,869	4,138,119	3,389,581	4,176,540	3,534,678	1,875,028	1,708,310	3,126,117	678,352	474,310	0	75,411	328,408	206,415	155,851	76,129	82,454	54,559	7,296
1999	59,193	4,370,130	21,094,936	25,329,588	30,845,761	17,996,839	9,664,071	4,873,535	4,823,712	4,192,565	5,098,974	5,769,049	4,789,230	5,287,483	5,135,641	2,162,481	2,188,902	1,532,192	1,472,044	495,759	383,552	262,589	691,851	230,347	288,305	71,710	21,275	131,652	20,354	6,984
2000	0	11,426,260	26,791,122	41,621,550	27,240,874	17,718,283	10,999,394	10,257,454	12,313,351	10,000,596	9,498,210	8,604,095	7,954,225	7,132,093	4,037,228	3,033,432	3,337,514	2,341,447	314,491	366,241	248,336	566,650	401,662	362,152	248,751	22,936	290,930	208,752	85,445	49,214
2001	0	1,563,380	12,699,120	12,712,835	7,570,461	6,090,033	6,209,380	7,402,771	8,254,157	6,762,651	6,475,539	4,322,783	4,021,108	2,008,335	1,592,195	1,241,033	358,565	48,668	171,621	48,523	150,233	376,180	241,181	128,162	0	19,188	67,323	39,432	23,186	34,266
2002	0	8,081,902	44,664,077	37,740,049	34,945,140	34,856,939	44,948,727	37,148,076	37,287,413	28,136,558	25,171,940	20,800,169	10,967,325	9,444,640	8,185,426	3,493,039	1,737,061	498,035	286,436	1,037,946	435,027	756,666	524,967	296,799	345,095	74,223	138,948	67,830	229,837	4,595
2003	24,299	12,606,945	31,435,728	28,243,174	32,190,794	39,859,146	35,301,889	33,280,033	24,609,720	22,541,766	19,192,673	9,070,150	6,213,351	5,044,348	3,679,917	1,772,846	826,847	253,658	1,239,269	598,519	386,316	391,899	191,204	160,091	162,234	234,302	0	120,725	0	21,734
2004	2,171,576	32,694,885	61,890,757	86,714,914	113,940,376	104,735,969	84,524,428	60,761,342	63,341,508	55,307,895	29,055,995	18,952,470	17,245,342	9,076,581	5,604,344	2,265,486	1,084,058	2,771,272	707,155	825,280	1,014,017	913,182	462,584	687,493	759,817	466,237	205,519	164,433	337,842	9,104
2005	1,900,666	22,265,730	63,866,693	105,587,528	108,136,622	103,952,206	71,381,285	68,251,590	59,743,497	37,039,131	29,907,659	19,078,701	10,309,313	6,228,576	2,962,209	1,390,932	3,222,027	1,864,819	1,728,849	1,304,878	910,625	761,668	1,027,094	766,160	886,791	308,783	275,790	124,925	95,879	21,828
2006	140,747	8,924,150	27,119,144	43,361,604	49,756,842	31,480,099	28,806,634	20,314,167	13,215,549	9,805,218	8,862,812	3,595,225	2,236,813	507,149	772,908	1,168,274	878,607	570,339	349,920	361,189	297,574	427,749	0	116,939	492,211	151,449	64,705	0	0	117,612
2007	0	5,217,606	20,041,085	31,701,998	22,976,711	19,184,753	15,847,502	6,707,377	4,867,008	5,748,282	3,580,482	2,090,030	705,065	301,382	654,907	610,717	228,260	453,733	79,206	276,741	239,222	50,849	140,250	205,227	198,190	140,430	68,874	0	117,234	0
2008	0	9,537,247	46,900,824	66,016,599	55,007,175	56,859,709	40,372,767	22,384,742	13,496,349	7,394,245	2,776,047	1,651,061	194,656	2,168,511	465,314	509,235	696,787	509,818	692,862	338,267	128,988	437,915	432,094	48,077	193,569	145,256	0	0	84,878	0
2009	941,454	16,815,306	41,305,319	46,422,729	50,335,421	40,640,876	24,352,616	22,689,679	11,184,301	7,370,312	2,922,997	1,579,967	3,373,192	1,510,580	765,970	773,335	512,216	599,432	573,858	494,776	383,393	316,336	255,029	0	15,917	0	30,539	59,127	58,976	0
2010	934,452	22,838,589	59,880,009	100,468,672	85,255,873	63,037,647	54,624,463	31,890,531	20,127,146	11,426,887	4,910,756	6,581,113	3,569,265	2,300,227	2,270,939	2,367,956	1,545,244	1,154,595	1,260,190	520,641	816,297	334,895	313,570	324,804	106,047	184,086	0	0	56,509	99,596
2011	91,078	16,284,943	45,344,900	41,680,883	39,532,280	29,596,425	18,824,537	12,304,627	5,889,790	1,546,034	6,385,881	2,325,744	2,511,298	2,890,211	1,466,601	890,157	897,835	879,157	527,818	125,907	568,243	628,409	240,172	127,509	527,334	34,642	0	0	35,797	21,737
2012	0	7,355,751	9,692,053	9,136,394	9,490,101	5,946,728	4,001,129	3,223,213	1,056,232	4,116,604	2,205,015	1,304,734	669,346	521,556	494,563	287,251	269,336	167,377	233,800	225,511	101,649	31,832	85,854	48,342	0	0	39,677	0	0	0
2013	0	681,545	1,487,737	2,813,594	1,439,253	1,319,563	1,004,042	312,671	898,741	10,379,722	546,802	643,630	729,920	195,792	177,761	119,823	83,535	59,306	46,783	147,384	0	0	53,109	70,433	0	0	0	0	0	0
2014	0	538,737	2,025,660	4,362,112	1,857,865	1,640,456	1,727,129	4,295,380	1,723,650	1,422,851	1,121,055	903,405	775,896	612,470	38,511	134,647	0	138,740	0	39,207	0	51,169	40,998	0	0	0	0	0	22,462	27,899
2015	0	94,604	1,959,068	953,932	925,348	490,111	3,053,599	1,712,072	1,050,227	1,040,532	739,754	443,800	326,498	41,914	219,380	291,034	254,223	0	0	106,841	202,515	0	0	40,758	0	0	0	27,701	0	0
2016	0	0	32,320	875,494	52,961	1,366,432	787,176	658,722	723,354	388,756	320,165	220,754	192,787	71,675	238,876	148,256	84,582	0	51,356	0	0	47,624	0	0	0	0	0	0	0	0
2017	0	0	297,040	0	2,517,846	1,132,117	648,754	684,519	1,032,337	124,171	418,285	0	209,839	0	198,908	124,254	37,655	59,551	0	0	0	0	0	0	0	56,625	0	0	0	0
2018	0	0	0	12,801,251	1,901,447	2,056,185	1,797,989	1,676,249	1,610,602	770,511	155,077	104,815	0	211,957	86,840	102,941	0	63,560	0	0	0	0	0	0	0	0	22,485	0	0	0
2019	0	0	2,392,851	1,914,437	2,063,508	1,836,739	1,968,785	261,094	845,819	302,928	258,861	361,957	80,298	69,201	160,792	72,100	0	0	0	0	0	0	0	0	0	0	31,981	0	0	0
2020	0	450,296	279,409	281,868	328,248	146,498	0	0	0	0	0	0	0	0	115,308	74,605	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 12: Conditional Loss Severity = Table 11/Table 10
Loss Severity for Each Evaluation Year

	Evaluation Year																													
Fiscal Year	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%	45.71%	52.23%	55.81%	56.15%	57.52%	54.46%	51.83%	48.43%	41.33%	38.60%	25.19%	25.94%	42.76%	9.19%	86.50%	36.24%	7.83%	0.00%	0.00%	64.50%	32.84%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	65.41%	0.00%
1991	0.00%	51.62%	56.04%	52.50%	52.57%	52.59%	49.01%	47.39%	42.76%	37.04%	32.79%	36.71%	21.28%	27.38%	34.81%	45.81%	58.41%	84.95%	67.63%	78.83%	83.31%	56.77%	44.58%	0.00%	7.50%	47.66%	25.57%	0.00%	0.00%	0.00%
1992	0.00%	56.05%	56.39%	55.92%	55.39%	47.80%	42.87%	40.40%	36.16%	29.52%	20.46%	23.75%	23.42%	16.49%	18.25%	35.04%	53.91%	54.48%	72.57%	63.56%	47.45%	45.05%	38.38%	24.43%	48.90%	8.33%	-14.09%	54.54%	0.00%	0.00%
1993	21.91%	53.74%	56.87%	54.21%	48.71%	41.90%	37.15%	34.73%	26.01%	23.41%	21.22%	23.75%	35.75%	44.14%	57.68%	60.44%	49.34%	71.61%	63.04%	46.60%	44.97%	42.24%	33.61%	42.15%	30.05%	52.17%	16.39%	89.16%	47.98%	54.55%
1994	45.61%	58.28%	55.78%	48.64%	38.53%	35.76%	31.05%	25.75%	21.67%	25.95%	24.26%	32.04%	31.11%	41.39%	65.82%	51.10%	62.58%	60.01%	58.27%	54.20%	28.19%	44.79%	39.47%	48.79%	20.51%	19.46%	21.15%	56.47%	59.12%	47.54%
1995	34.01%	59.51%	47.43%	38.80%	35.60%	34.14%	29.17%	24.49%	29.65%	29.03%	31.78%	30.68%	60.63%	54.93%	61.95%	62.88%	61.36%	59.62%	58.42%	48.64%	56.43%	51.95%	44.72%	47.13%	52.01%	28.32%	62.73%	49.40%	59.41%	71.88%
1996	41.53%	43.53%	38.87%	35.10%	32.86%	27.93%	25.54%	28.46%	32.88%	30.79%	38.10%	48.66%	56.60%	61.12%	59.43%	60.71%	62.44%	47.42%	62.14%	51.81%	59.54%	41.69%	40.70%	27.30%	33.44%	65.84%	68.54%	62.43%	63.21%	56.46%
1997	33.92%	43.04%	38.78%	33.41%	29.25%	26.33%	29.32%	29.83%	31.49%	34.00%	44.68%	57.85%	59.30%	64.87%	66.68%	58.83%	63.21%	51.46%	54.12%	61.05%	51.25%	53.25%	17.68%	64.91%	59.46%	57.67%	58.69%	74.05%	53.78%	59.34%
1998	51.49%	42.31%	36.07%	29.43%	26.22%	28.69%	30.32%	26.14%	37.89%	43.28%	55.53%	58.38%	58.66%	63.12%	61.75%	59.95%	51.59%	47.54%	63.59%	41.71%	46.28%	0.00%	55.25%	69.62%	67.33%	70.10%	75.65%	48.11%	48.90%	100.00%
1999	24.56%	37.97%	34.50%	28.25%	28.52%	29.35%	32.04%	30.92%	45.43%	51.56%	49.12%	56.96%	63.46%	63.75%	61.23%	43.92%	51.44%	46.46%	53.23%	39.61%	55.24%	65.89%	58.18%	64.09%	50.43%	63.94%	100.00%	55.34%	43.82%	100.00%
2000	0.00%	35.57%	29.62%	32.38%	32.46%	35.18%	33.78%	43.74%	54.30%	54.89%	58.83%	67.55%	65.51%	52.02%	48.16%	51.94%	61.78%	55.00%	25.19%	44.81%	57.55%	62.94%	70.32%	66.75%	63.06%	100.00%	67.63%	55.94%	48.35%	70.21%
2001	0.00%	27.16%	34.42%	33.34%	32.86%	35.43%	43.99%	60.28%	57.94%	59.78%	63.26%	63.84%	56.22%	39.22%	51.63%	50.27%	36.00%	9.65%	51.19%	36.06%	42.08%	68.72%	79.33%	84.38%	0.00%	100.00%	41.25%	47.85%	100.00%	58.82%
2002	0.00%	37.31%	36.01%	33.34%	36.98%	45.54%	55.95%	55.77%	63.65%	66.86%	62.62%	60.62%	50.49%	57.43%	58.94%	62.23%	54.67%	29.59%	45.82%	59.54%	55.99%	59.82%	58.26%	44.46%	60.22%	100.00%	84.46%	35.38%	55.31%	100.00%
2003	6.73%	41.54%	37.25%	37.00%	44.92%	51.78%	57.99%	59.64%	65.15%	63.82%	61.49%	52.01%	54.54%	47.27%	66.75%	58.96%	56.02%	40.76%	52.30%	76.81%	44.91%	71.20%	69.56%	68.02%	63.14%	54.25%	0.00%	75.79%	0.00%	50.55%
2004	38.88%	41.88%	39.64%	47.39%	54.22%	58.74%	62.20%	64.84%	66.61%	60.42%	53.27%	52.13%	55.96%	61.94%	60.67%	47.81%	61.63%	60.99%	57.17%	55.26%	65.31%	74.49%	54.76%	53.34%	65.67%	55.82%	51.95%	57.34%	54.95%	100.00%
2005	54.03%	41.70%	48.71%	56.15%	59.40%	64.89%	67.43%	67.53%	61.30%	54.60%	57.19%	57.78%	60.29%	66.83%	63.66%	49.60%	62.10%	63.50%	65.51%	59.66%	73.77%	78.74%	57.64%	67.30%	59.09%	51.52%	57.93%	54.47%	80.43%	100.00%
2006	40.11%	48.47%	60.38%	63.12%	67.63%	68.50%	66.80%	64.45%	56.09%	57.26%	60.30%	57.99%	54.57%	30.57%	72.40%	65.11%	69.28%	63.58%	56.07%	59.04%	60.42%	65.18%	0.00%	69.27%	60.77%	64.63%	100.00%	0.00%	0.00%	68.09%
2007	0.00%	56.65%	61.06%	66.01%	66.25%	66.57%	64.55%	52.65%	56.30%	67.35%	63.24%	61.67%	36.88%	88.78%	64.25%	67.62%	70.13%	64.48%	42.98%	87.22%	77.03%	55.87%	50.15%	61.57%	57.74%	51.30%	100.00%	0.00%	59.96%	0.00%
2008	0.00%	60.66%	63.89%	67.30%	66.11%	62.79%	53.13%	58.66%	58.48%	46.36%	46.23%	51.79%	22.97%	62.44%	44.62%	49.09%	82.71%	66.37%	75.48%	52.84%	70.69%	62.96%	69.88%	100.00%	52.57%	100.00%	0.00%	0.00%	58.27%	0.00%
2009	69.76%	62.15%	67.84%	64.39%	48.84%	49.07%	51.23%	59.90%	53.41%	61.32%	55.84%	39.03%	61.37%	58.16%	67.10%	66.62%	53.21%	59.85%	100.00%	65.42%	70.14%	63.03%	63.86%	0.00%	100.00%	0.00%	100.00%	52.64%	100.00%	0.00%
2010	51.46%	71.69%	65.99%	58.00%	45.09%	50.66%	54.64%	65.33%	59.10%	59.58%	55.60%	55.05%	60.22%	62.95%	73.21%	78.12%	65.24%	71.51%	63.00%	62.63%	68.18%	50.35%	47.14%	89.21%	65.33%	41.76%	0.00%	0.00%	41.22%	89.19%
2011	10.66%	70.19%	60.35%	43.66%	45.66%	56.35%	56.67%	58.28%	52.87%	37.66%	52.24%	65.82%	73.98%	81.40%	65.15%	67.59%	59.26%	53.31%	60.93%	53.98%	56.08%	48.58%	47.45%	62.14%	54.39%	100.00%	0.00%	0.00%	60.11%	100.00%
2012	0.00%	67.53%	44.06%	50.72%	49.76%	42.99%	41.20%	49.04%	45.52%	54.27%	56.25%	45.24%	62.21%	67.84%	44.19%	100.00%	84.04%	54.31%	53.39%	46.60%	56.37%	100.00%	50.86%	52.06%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%
2013	0.00%	33.98%	35.76%	55.39%	44.02%	41.29%	31.88%	36.12%	50.97%	77.99%	73.26%	54.67%	52.42%	67.14%	100.00%	45.35%	100.00%	46.94%	41.21%	42.59%	0.00%	0.00%	41.85%	50.64%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2014	0.00%	25.66%	43.93%	40.77%	43.60%	38.50%	54.98%	56.15%	62.40%	51.44%	57.51%	53.58%	61.78%	73.35%	100.00%	36.50%	0.00%	46.86%	0.00%	100.00%	0.00%	59.62%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	53.27%	63.82%
2015	0.00%	11.35%	50.06%	30.82%	39.74%	29.89%	52.09%	48.20%	45.87%	81.75%	53.83%	53.08%	61.16%	100.00%	52.71%	48.91%	100.00%	0.00%	0.00%	72.74%	66.11%	0.00%	0.00%	48.73%	0.00%	0.00%	0.00%	55.98%	0.00%	0.00%
2016	0.00%	0.00%	6.67%	49.69%	15.34%	43.46%	76.79%	61.53%	71.61%	57.54%	100.00%	67.14%	100.00%	100.00%	66.30%	87.38%	45.76%	0.00%	100.00%	0.00%	0.00%	57.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2017	0.00%	0.00%	52.52%	0.00%	61.49%	58.78%	79.23%	65.59%	69.77%	51.84%	50.10%	0.00%	85.51%	0.00%	61.68%	100.00%	22.57%	54.72%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	61.04%	0.00%	0.00%	0.00%	0.00%
2018	0.00%	0.00%	0.00%	74.58%	51.76%	59.15%	65.05%	63.92%	58.78%	50.84%	100.00%	100.00%	0.00%	62.56%	44.71%	52.49%	0.00%	58.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%
2019	0.00%	0.00%	74.80%	60.77%	70.08%	62.47%	61.46%	78.51%	83.97%	72.95%	47.43%	71.04%	55.49%	100.00%	58.68%	62.43%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%
2020	0.00%	56.60%	100.00%	67.32%	62.77%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	63.70%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Cumulative Loss Rate
ARM

Table 13: Cumulative Gross Claim Cost
Total Gross Losses for each Fiscal Year as of the End of the Evaluation Year

	Evaluation Year														
Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1990	0	1,109,037	4,494,186	10,373,376	17,692,715	23,211,717	29,543,027	36,324,583	41,841,415	44,601,665	47,241,098	48,321,961	48,751,702	49,129,076	49,397,056
1991	71,157	2,214,194	17,177,000	40,427,835	68,469,612	98,045,674	134,682,470	167,360,444	188,681,899	202,877,956	210,033,988	213,136,317	214,940,041	216,751,672	217,459,269
1992	79,894	10,282,608	58,497,265	130,747,665	227,774,111	350,465,588	453,326,169	520,887,847	565,743,266	585,525,279	596,949,892	605,303,359	609,204,081	610,894,074	612,250,603
1993	265,917	17,983,069	91,445,432	220,280,317	419,572,115	591,078,760	712,146,157	786,863,920	822,109,292	841,976,202	857,429,819	864,327,963	867,055,890	868,709,421	870,416,118
1994	535,940	34,724,691	204,819,103	540,357,595	894,811,533	1,157,371,545	1,316,134,172	1,394,674,151	1,439,993,518	1,472,196,227	1,487,766,283	1,494,196,622	1,499,064,025	1,501,834,128	1,504,601,573
1995	673,354	34,044,620	218,471,456	506,287,318	763,696,148	910,102,035	989,372,650	1,040,557,310	1,083,069,399	1,105,886,566	1,115,997,668	1,123,289,829	1,125,913,567	1,129,073,323	1,131,711,829
1996	302,438	53,596,204	332,361,939	752,471,097	1,044,225,997	1,214,585,108	1,329,808,601	1,422,321,463	1,464,759,597	1,484,854,822	1,496,957,675	1,503,813,384	1,512,671,694	1,519,565,792	1,526,504,828
1997	661,798	90,362,642	473,511,758	906,413,609	1,215,078,198	1,440,480,637	1,611,685,099	1,690,476,394	1,730,020,712	1,752,142,832	1,767,484,902	1,781,125,345	1,792,918,603	1,806,585,689	1,816,651,219
1998	1,301,992	79,529,062	249,917,718	397,011,213	509,795,370	600,227,070	647,498,484	671,421,909	685,416,285	694,155,856	701,977,932	709,020,626	716,074,581	721,445,055	728,208,962
1999	240,968	11,750,543	72,897,918	162,550,420	270,716,215	332,036,744	362,203,630	377,965,429	388,584,084	396,715,706	407,095,540	417,224,124	424,771,253	433,065,004	441,451,988
2000	77,444	32,196,898	122,633,562	251,190,923	335,119,250	385,478,985	418,039,038	441,490,907	464,168,150	482,387,158	498,533,622	511,271,123	523,412,918	537,124,192	545,507,147
2001	0	5,755,293	42,653,521	80,780,835	103,820,369	121,007,172	135,123,779	147,403,633	161,649,052	172,961,470	183,198,359	189,970,054	197,122,276	202,243,004	205,326,658
2002	33,295	21,694,367	145,743,186	258,935,164	353,442,952	429,979,190	510,311,678	576,923,345	635,509,543	677,593,467	717,791,038	752,105,489	773,828,078	790,272,920	804,159,916
2003	360,979	30,710,801	115,097,810	191,424,729	263,090,616	340,075,744	400,946,789	456,749,091	494,525,684	529,848,325	561,058,922	578,497,283	589,888,765	600,559,947	606,072,882
2004	5,585,737	83,649,318	239,767,297	422,753,984	632,904,674	811,207,471	947,097,706	1,040,813,954	1,135,909,756	1,227,454,708	1,282,000,745	1,318,355,113	1,349,170,407	1,363,825,167	1,373,062,878
2005	3,517,586	56,908,490	188,025,885	376,062,207	558,114,241	718,300,739	824,155,200	925,227,965	1,022,689,656	1,090,526,961	1,142,820,659	1,175,842,168	1,192,942,085	1,202,261,875	1,206,914,882
2006	350,879	18,761,781	63,676,867	132,371,670	205,945,451	251,900,978	295,025,733	326,545,771	350,108,332	367,230,908	381,928,519	388,128,668	392,227,814	393,886,655	394,954,229
2007	54,588	9,264,089	42,086,652	90,110,226	124,793,133	153,611,546	178,161,393	190,902,147	199,547,467	208,082,718	213,744,335	217,133,190	219,045,097	219,384,569	220,403,934
2008	25,302	15,748,024	89,157,606	187,243,891	270,444,989	360,997,168	436,984,220	475,144,902	498,222,959	514,172,183	520,176,963	523,365,247	524,212,575	527,685,779	528,728,608
2009	1,349,610	28,407,046	89,297,771	161,393,063	264,463,555	347,285,609	394,817,432	432,697,857	453,638,654	465,658,372	470,892,947	474,941,126	480,437,338	483,034,432	484,175,963
2010	1,815,964	33,671,303	124,406,234	297,625,387	486,713,880	611,151,144	711,120,661	759,933,987	793,988,802	813,168,197	822,001,082	833,955,389	839,882,463	843,536,651	846,638,636
2011	854,442	24,055,047	99,190,317	194,666,218	281,250,264	333,769,037	366,984,044	388,096,878	399,236,136	403,341,744	415,564,967	419,098,470	422,492,947	426,043,388	428,294,535
2012	745,107	11,636,924	33,631,959	51,646,354	70,718,462	84,551,747	94,263,347	100,835,367	103,155,691	110,740,447	114,660,484	117,544,246	118,620,234	119,389,091	120,508,382
2013	278,170	2,283,774	6,444,340	11,524,306	14,793,567	17,989,573	21,138,982	22,004,706	23,767,897	37,077,579	37,823,932	39,001,131	40,393,481	40,685,081	40,862,842
2014	0	2,099,424	6,710,877	17,409,274	21,670,169	25,930,915	29,072,443	36,721,988	39,484,322	42,250,448	44,199,864	45,886,106	47,141,924	47,976,924	48,015,435
2015	0	833,453	4,746,766	7,842,290	10,170,801	11,810,572	17,673,056	21,225,021	23,514,844	24,787,644	26,161,951	26,998,036	27,531,862	27,573,776	27,990,003
2016	0	104,778	589,145	2,350,965	2,696,274	5,840,553	6,865,700	7,936,226	8,946,312	9,621,911	9,942,076	10,270,888	10,463,675	10,535,351	10,895,646
2017	0	39,666	605,246	880,296	4,975,039	6,901,141	7,719,914	8,763,576	10,243,237	10,482,783	11,317,632	11,317,632	11,563,019	11,563,019	11,885,503
2018	0	502,979	995,633	18,160,037	21,833,543	25,309,573	28,073,433	30,696,003	33,435,914	34,951,397	35,106,474	35,211,289	35,211,289	35,550,074	35,744,316
2019	0	134,246	3,333,149	6,483,707	9,428,262	12,368,667	15,571,957	15,904,509	16,911,820	17,327,057	17,872,784	18,382,326	18,527,038	18,596,238	18,870,270
2020	0	795,582	1,074,992	1,493,716	2,016,662	2,163,161	2,163,161	2,163,161	2,163,161	2,163,161	2,163,161	2,163,161	2,163,161	2,163,161	2,344,185

	Evaluation Year														
Fiscal Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1990	49,467,498	49,552,745	49,664,623	49,664,623	49,664,623	49,775,764	49,818,650	49,818,650	49,818,650	49,870,567	49,870,567	49,890,960	49,890,960	49,905,436	49,905,436
1991	218,049,290	218,164,597	218,349,923	218,566,964	219,048,535	219,167,610	219,725,065	220,015,641	220,094,404	220,215,717	220,529,446	220,742,866	220,787,887	220,805,487	220,805,487
1992	613,023,065	613,713,156	615,168,059	616,166,704	616,923,976	617,765,517	618,919,872	619,753,843	620,594,364	621,728,979	622,062,852	622,378,051	622,598,231	622,598,231	622,598,231
1993	871,655,789	872,938,285	874,497,118	875,696,323	876,848,857	878,382,500	879,690,541	880,883,853	882,561,197	883,165,583	883,829,229	884,098,284	884,310,836	884,498,729	884,643,648
1994	1,507,029,065	1,510,819,108	1,514,127,014	1,516,366,511	1,519,972,637	1,522,343,879	1,524,304,548	1,526,507,668	1,528,118,252	1,529,050,963	1,529,511,567	1,529,603,011	1,530,151,649	1,530,520,802	1,530,583,357
1995	1,135,740,234	1,138,532,814	1,140,686,710	1,143,977,756	1,146,405,278	1,148,834,205	1,152,115,751	1,154,155,660	1,155,084,263	1,155,618,324	1,155,745,817	1,156,003,640	1,156,027,884	1,156,294,971	1,156,420,664
1996	1,533,100,235	1,538,347,478	1,544,491,542	1,548,662,845	1,554,039,318	1,559,712,486	1,562,635,745	1,563,752,822	1,564,999,440	1,565,180,081	1,565,695,456	1,565,888,835	1,566,044,881	1,566,120,358	1,566,255,904
1997	1,825,974,060	1,834,535,909	1,842,273,515	1,850,370,826	1,857,777,944	1,861,899,561	1,863,808,514	1,864,496,020	1,865,114,748	1,866,250,476	1,867,338,935	1,868,017,505	1,868,526,638	1,869,011,799	1,869,241,262
1998	734,105,329	737,740,126	741,333,760	746,249,479	747,875,830	748,900,809	749,151,705	749,288,205	749,759,952	750,066,517	750,288,847	750,389,486	750,560,875	750,672,443	750,679,739
1999	446,375,928	450,630,846	453,928,616	456,693,876	457,945,597	458,639,887	459,038,401	460,227,626	460,587,025	461,158,711	461,270,858	461,292,133	461,530,010	461,576,461	461,583,445
2000	551,347,262	556,749,322	561,006,438	562,254,706	563,071,968	563,503,483	564,403,844	564,975,024	565,517,590	565,912,055	565,934,990	566,365,151	566,738,320	566,915,028	566,985,120
2001	207,795,421	208,791,455	209,295,839	209,631,118	209,765,683	210,122,697	210,670,125	210,974,148	211,126,034	211,126,034	211,145,222	211,308,420	211,390,832	211,414,018	211,472,278
2002	809,773,129	812,950,292	814,633,690	815,258,789	817,002,176	817,779,137	819,044,026	819,945,146	820,612,672	821,185,707	821,259,931	821,424,451	821,616,179	822,031,739	822,036,334
2003	609,079,991	610,556,024	611,178,341	613,547,783	614,326,975	615,187,155	615,737,537	616,012,422	616,247,768	616,504,718	616,936,644	616,936,644	617,095,931	617,095,931	617,138,925
2004	1,377,801,330	1,379,560,246	1,384,104,412	1,385,341,379	1,386,834,956	1,388,387,550	1,389,613,438	1,390,458,123	1,391,746,979	1,392,904,061	1,393,739,321	1,394,134,928	1,394,421,720	1,395,036,485	1,395,045,589
2005	1,209,719,056	1,214,907,286	1,217,844,084	1,220,483,077	1,222,670,346	1,223,904,835	1,224,872,148	1,226,654,175	1,227,792,533	1,229,293,230	1,229,892,577	1,230,368,629	1,230,597,978	1,230,717,186	1,230,739,013
2006	396,748,666	398,016,928	398,914,036	399,538,159	400,149,974	400,642,495	401,298,780	401,298,780	401,467,605	402,277,619	402,511,951	402,576,656	402,576,656	402,576,656	402,749,375
2007	221,307,108	221,632,606	222,336,330	222,520,608	222,837,887	223,148,453	223,239,469	223,519,112	223,852,435	224,195,691	224,469,428	224,538,303	224,538,303	224,733,830	224,733,830
2008	529,765,952	530,608,364	531,376,541	532,294,469	532,934,595	533,117,057	533,812,564	534,430,899	534,478,976	534,847,172	534,992,428	534,992,428	534,992,428	535,138,102	535,138,102
2009	485,336,847	486,299,500	487,301,017	487,874,875	488,631,182	489,177,823	489,679,730	490,079,095	490,079,095	490,095,013	490,095,013	490,125,551	490,237,874	490,296,850	490,296,850
2010	849,669,645	852,038,265	853,652,850	855,653,260	856,484,542	857,681,773	858,346,939	859,012,137	859,376,216	859,538,548	859,979,405	859,979,405	859,979,405	860,116,481	860,228,144
2011	429,611,434	431,126,541	432,775,815	433,642,117	433,875,362	434,888,647	436,182,330	436,688,450	436,893,650	437,863,179	437,897,821	437,897,821	437,897,821	437,957,373	437,979,111
2012	120,795,634	121,116,125	121,424,329	121,862,259	122,346,218	122,526,535	122,558,367	122,727,161	122,820,012	122,820,012	122,820,012	122,859,688	122,859,688	122,859,688	122,859,688
2013	41,127,050	41,210,586	41,336,928	41,450,448	41,796,482	41,796,482	41,796,482	41,923,374	42,062,467	42,062,467	42,062,467	42,062,467	42,062,467	42,062,467	42,062,467
2014	48,384,349	48,384,349	48,680,449	48,680,449	48,719,656	48,719,656	48,805,475	48,846,473	48,846,473	48,846,473	48,846,473	48,846,473	48,846,473	48,888,641	48,932,357
2015	28,585,045	28,839,267	28,839,267	28,839,267	28,986,154	29,292,497	29,292,497	29,292,497	29,376,142	29,376,142	29,376,142	29,376,142	29,425,625	29,425,625	29,425,625
2016	11,065,307	11,250,127	11,250,127	11,301,483	11,301,483	11,301,483	11,384,902	11,384,902	11,384,902	11,384,902	11,384,902	11,384,902	11,384,902	11,384,902	11,384,902
2017	12,009,757	12,176,595	12,285,414	12,285,414	12,285,414	12,285,414	12,285,414	12,285,414	12,285,414	12,285,414	12,378,184	12,378,184	12,378,184	12,378,184	12,378,184
2018	35,940,436	35,940,436	36,049,605	36,049,605	36,049,605	36,049,605	36,049,605	36,049,605	36,049,605	36,049,605	36,049,605	36,072,090	36,072,090	36,072,090	36,072,090
2019	18,985,758	18,985,758	18,985,758	18,985,758	18,985,758	18,985,758	18,985,758	18,985,758	18,985,758	18,985,758	18,985,758	19,017,740	19,017,740	19,017,740	19,017,740
2020	2,418,790	2,418,790	2,418,790	2,418,790	2,418,790	2,418,790	2,418,790	2,418,790	2,418,790	2,418,790	2,418,790	2,418,790	2,418,790	2,418,790	2,418,790

Table 14: Cumulative Claim Cost Net of Recovery
Total Losses Net of Recovery for each Fiscal Year as of the End of the Evaluation Year

	Evaluation Year														
Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1990	0	506,957	2,274,962	5,556,071	9,666,017	12,840,506	16,288,270	19,803,174	22,475,073	23,616,003	24,634,744	24,906,986	25,018,458	25,179,817	25,204,439
1991	0	1,106,186	9,491,192	21,698,663	36,440,985	51,993,727	69,949,428	85,436,898	94,553,008	99,810,789	102,157,336	103,296,054	103,679,798	104,175,735	104,422,055
1992	0	5,718,326	32,905,808	73,307,630	127,054,618	185,706,923	229,804,743	257,102,183	273,322,228	279,162,531	281,500,078	283,483,908	284,397,268	284,675,905	284,923,420
1993	58,273	9,579,235	51,355,704	121,198,082	218,269,939	290,134,204	335,108,539	361,055,559	370,222,918	374,874,058	378,154,016	379,792,139	380,767,283	381,497,148	382,481,510
1994	244,425	20,169,155	115,051,881	278,259,132	414,840,872	508,722,837	558,025,204	578,253,015	588,072,456	596,430,499	600,207,594	602,267,666	603,781,917	604,928,329	606,749,882
1995	228,984	20,087,621	107,570,009	219,228,648	310,858,696	360,847,148	383,971,205	396,508,225	409,114,452	415,738,130	418,951,148	421,188,519	422,779,184	424,514,812	426,149,417
1996	125,608	23,325,132	131,680,266	279,135,650	375,002,944	422,590,570	452,024,119	478,351,064	492,304,786	498,491,345	503,102,680	506,438,942	511,452,805	515,666,294	519,790,003
1997	224,473	38,830,100	187,398,158	332,021,330	422,311,323	481,669,632	531,858,981	555,364,839	567,816,209	575,337,002	582,191,285	590,082,500	597,075,984	605,942,091	612,653,523
1998	670,450	33,765,880	95,223,242	138,513,548	168,084,657	194,026,905	208,357,596	214,610,166	219,912,421	223,694,479	228,038,443	232,150,312	236,288,431	239,678,012	243,854,553
1999	59,193	4,429,322	25,524,258	50,853,846	81,699,607	99,696,447	109,360,517	114,234,053	119,057,765	123,250,329	128,349,303	134,118,352	138,907,582	144,195,065	149,330,707
2000	0	11,426,260	38,217,382	79,838,932	107,079,807	124,798,090	135,797,484	146,054,938	158,368,289	168,368,885	177,867,096	186,471,191	194,425,415	201,557,508	205,594,736
2001	0	1,563,380	14,262,500	26,975,335	34,545,796	40,635,829	46,845,209	54,247,981	62,502,138	69,264,789	75,740,328	80,063,111	84,084,219	86,092,554	87,684,749
2002	0	8,081,902	52,745,979	90,486,028	125,431,168	160,288,107	205,236,834	242,384,911	279,672,324	307,808,882	332,980,822	353,780,991	364,748,315	374,192,955	382,378,382
2003	24,299	12,631,244	44,066,972	72,310,146	104,500,940	144,360,086	179,661,976	212,942,009	237,551,729	260,093,495	279,286,168	288,356,318	294,569,669	299,614,016	303,293,933
2004	2,171,576	34,866,461	96,757,217	183,472,131	297,412,507	402,148,476	486,672,904	547,434,245	610,775,754	666,083,648	695,139,644	714,092,113	731,337,455	740,414,036	746,018,380
2005	1,900,666	24,166,396	88,033,089	193,620,617	301,757,239	405,709,445	477,090,731	545,342,321	605,085,818	642,124,949	672,032,608	691,111,309	701,420,622	707,649,199	710,611,408
2006	140,747	9,064,897	36,184,041	79,545,645	129,302,487	160,782,586	189,589,220	209,903,387	223,118,935	232,924,153	241,786,965	245,382,190	247,619,003	248,126,153	248,899,061
2007	0	5,217,606	25,258,691	56,960,689	79,937,400	99,122,153	114,969,655	121,677,033	126,544,041	132,292,323	135,872,805	137,962,835	138,667,901	138,969,282	139,624,189
2008	0	9,537,247	56,438,070	122,454,669	177,461,845	234,321,554	274,694,321	297,079,063	310,575,412	317,969,657	320,745,704	322,396,765	322,591,421	324,759,932	325,225,246
2009	941,454	17,756,760	59,062,079	105,484,807	155,820,228	196,461,104	220,813,720	243,503,399	254,687,700	262,058,012	264,981,009	266,560,976	269,934,167	271,444,747	272,210,716
2010	934,452	23,773,041	83,653,050	184,121,722	269,377,595	332,415,241	387,039,705	418,930,236	439,057,382	450,484,269	455,395,025	461,976,138	465,545,403	467,845,630	470,116,569
2011	91,078	16,376,021	61,720,921	103,401,804	142,934,084	172,530,510	191,355,047	203,659,674	209,549,464	211,095,498	217,481,380	219,807,124	222,318,422	225,208,633	226,675,234
2012	0	7,355,751	17,047,804	26,184,198	35,674,298	41,621,026	45,622,155	48,845,368	49,901,600	54,018,203	56,223,219	57,527,953	58,197,299	58,718,855	59,213,418
2013	0	681,545	2,169,281	4,982,875	6,422,128	7,741,691	8,745,733	9,058,405	9,957,146	20,336,868	20,883,670	21,527,300	22,257,220	22,453,012	22,630,773
2014	0	538,737	2,564,397	6,926,509	8,784,374	10,424,830	12,151,959	16,447,339	18,170,989	19,593,840	20,714,894	21,618,300	22,394,195	23,006,666	23,045,177
2015	0	94,604	2,053,672	3,007,605	3,932,953	4,423,064	7,476,662	9,188,735	10,238,962	11,279,494	12,019,248	12,463,048	12,789,546	12,831,460	13,050,840
2016	0	0	32,320	907,814	960,775	2,327,207	3,114,383	3,773,105	4,496,459	4,885,215	5,205,381	5,426,134	5,618,922	5,690,597	5,929,473
2017	0	0	297,040	297,040	2,814,886	3,947,003	4,595,757	5,280,276	6,312,613	6,436,783	6,855,068	6,855,068	7,064,907	7,064,907	7,263,815
2018	0	0	0	12,801,251	14,702,698	16,758,883	18,556,872	20,233,120	21,843,722	22,614,233	22,769,310	22,874,125	22,874,125	23,086,082	23,172,923
2019	0	0	2,392,851	4,307,287	6,370,795	8,207,534	10,176,319	10,437,413	11,283,232	11,586,160	11,845,021	12,206,978	12,287,275	12,356,476	12,517,268
2020	0	450,296	729,705	1,011,572	1,339,820	1,486,319	1,486,319	1,486,319	1,486,319	1,486,319	1,486,319	1,486,319	1,486,319	1,486,319	1,601,626

	Evaluation Year														
Fiscal Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1990	25,265,374	25,296,268	25,305,032	25,305,032	25,305,032	25,376,718	25,390,801	25,390,801	25,390,801	25,390,801	25,390,801	25,390,801	25,390,801	25,400,270	25,400,270
1991	104,692,337	104,759,683	104,917,112	105,063,886	105,443,496	105,542,701	105,859,196	105,988,723	105,988,723	105,997,827	106,147,352	106,201,919	106,201,919	106,201,919	106,201,919
1992	285,194,109	285,566,127	286,358,698	287,083,442	287,564,743	287,964,072	288,484,052	288,804,166	289,009,465	289,564,239	289,592,050	289,547,631	289,667,713	289,667,713	289,667,713
1993	383,230,813	383,863,639	384,979,959	385,735,944	386,273,015	386,962,674	387,515,216	387,916,290	388,623,257	388,804,898	389,151,098	389,195,196	389,384,711	389,474,859	389,553,910
1994	607,990,404	610,362,224	612,347,164	613,652,226	615,606,738	616,275,215	617,153,317	618,022,990	618,808,777	619,000,046	619,089,689	619,109,030	619,418,836	619,637,070	619,666,810
1995	428,682,485	430,396,115	431,680,266	433,603,056	434,783,867	436,154,535	437,859,338	438,771,561	439,209,255	439,487,033	439,523,137	439,684,876	439,696,853	439,855,532	439,945,878
1996	523,794,324	527,070,590	529,983,991	532,575,905	535,361,478	538,739,543	539,958,191	540,412,804	540,753,098	540,813,502	541,152,838	541,285,384	541,382,804	541,430,512	541,507,038
1997	618,138,091	623,550,122	627,532,155	631,914,783	636,436,468	638,548,641	639,565,207	639,686,767	640,088,369	640,763,716	641,391,468	641,789,737	642,166,755	642,427,675	642,563,829
1998	247,389,230	249,264,258	250,972,568	254,098,685	254,777,037	255,251,346	255,251,346	255,326,757	255,655,165	255,861,580	256,017,431	256,093,560	256,176,015	256,230,574	256,237,870
1999	151,493,188	153,682,090	155,214,282	156,686,326	157,182,085	157,565,637	157,828,226	158,520,077	158,750,424	159,038,729	159,110,438	159,131,713	159,263,366	159,283,720	159,290,704
2000	208,628,168	211,965,682	214,307,129	214,621,620	214,987,861	215,236,197	215,802,846	216,204,508	216,566,660	216,815,411	216,838,347	217,129,277	217,338,029	217,423,474	217,472,688
2001	88,925,782	89,284,347	89,333,015	89,504,637	89,553,159	89,703,393	90,079,572	90,320,753	90,448,915	90,448,915	90,468,103	90,535,427	90,574,859	90,598,045	90,632,311
2002	385,871,421	387,608,482	388,106,517	388,392,953	389,430,899	389,865,925	390,622,592	391,147,559	391,444,358	391,789,454	391,863,677	392,002,625	392,070,455	392,300,292	392,304,887
2003	305,066,779	305,893,626	306,147,284	307,386,553	307,985,072	308,371,388	308,763,287	308,954,491	309,114,582	309,276,816	309,511,117	309,511,117	309,631,843	309,631,843	309,653,577
2004	748,283,866	749,367,924	752,139,196	752,846,352	753,671,631	754,685,648	755,598,830	756,061,414	756,748,907	757,508,724	757,974,962	758,180,481	758,344,913	758,682,755	758,691,860
2005	712,002,340	715,224,367	717,089,186	718,818,035	720,122,913	721,033,538	721,795,205	722,822,299	723,588,459	724,475,249	724,784,032	725,059,822	725,184,747	725,280,626	725,302,453
2006	250,067,335	250,945,942	251,516,281	251,866,201	252,227,390	252,524,964	252,952,714	252,952,714	253,069,653	253,561,863	253,713,313	253,778,017	253,778,017	253,778,017	253,895,629
2007	140,234,906	140,463,166	140,916,898	140,996,104	141,272,845	141,512,067	141,562,916	141,703,166	141,908,393	142,106,583	142,247,013	142,315,888	142,315,888	142,433,121	142,433,121
2008	325,734,481	326,431,268	326,941,086	327,633,948	327,972,215	328,101,204	328,539,118	328,971,213	329,019,290	329,212,859	329,358,115	329,358,115	329,358,115	329,442,993	329,442,993
2009	272,984,052	273,496,267	274,095,700	274,669,558	275,164,334	275,547,727	275,864,063	276,119,092	276,119,092	276,135,010	276,135,010	276,165,548	276,224,675	276,283,652	276,283,652
2010	472,484,525	474,029,769	475,184,364	476,444,554	476,965,195	477,781,492	478,116,387	478,429,957	478,754,761	478,860,808	479,044,894	479,044,894	479,044,894	479,101,403	479,200,999
2011	227,565,391	228,463,226	229,342,383	229,870,202	229,996,108	230,564,351	231,192,760	231,432,932	231,560,441	232,087,775	232,122,417	232,122,417	232,122,417	232,158,214	232,179,951
2012	59,500,669	59,770,005	59,937,382	60,171,182	60,396,693	60,498,342	60,530,173	60,616,027	60,664,369	60,664,369	60,664,369	60,704,046	60,704,046	60,704,046	60,704,046
2013	22,750,596	22,834,132	22,893,438	22,940,222	23,087,606	23,087,606	23,087,606	23,140,715	23,211,148	23,211,148	23,211,148	23,211,148	23,211,148	23,211,148	23,211,148
2014	23,179,823	23,179,823	23,318,564	23,318,564	23,357,770	23,357,770	23,408,939	23,449,937	23,449,937	23,449,937	23,449,937	23,449,937	23,449,937	23,472,400	23,500,299
2015	13,341,874	13,596,097	13,596,097	13,596,097	13,702,937	13,905,452	13,905,452	13,905,452	13,946,210	13,946,210	13,946,210	13,946,210	13,973,910	13,973,910	13,973,910
2016	6,077,729	6,162,312	6,162,312	6,213,667	6,213,667	6,213,667	6,261,291	6,261,291	6,261,291	6,261,291	6,261,291	6,261,291	6,261,291	6,261,291	6,261,291
2017	7,388,069	7,425,724	7,485,275	7,485,275	7,485,275	7,485,275	7,485,275	7,485,275	7,485,275	7,485,275	7,541,900	7,541,900	7,541,900	7,541,900	7,541,900
2018	23,275,863	23,275,863	23,339,423	23,339,423	23,339,423	23,339,423	23,339,423	23,339,423	23,339,423	23,339,423	23,339,423	23,361,908	23,361,908	23,361,908	23,361,908
2019	12,589,368	12,589,368	12,589,368	12,589,368	12,589,368	12,589,368	12,589,368	12,589,368	12,589,368	12,589,368	12,589,368	12,621,350	12,621,350	12,621,350	12,621,350
2020	1,676,231	1,676,231	1,676,231	1,676,231	1,676,231	1,676,231	1,676,231	1,676,231	1,676,231	1,676,231	1,676,231	1,676,231	1,676,231	1,676,231	1,676,231

Table 15: Cumulative Loss Severity = Table 14/Table 13
Loss Severity for Each Evaluation Year

	Evaluation Year														
Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1990	0.00%	45.71%	50.62%	53.56%	54.63%	55.32%	55.13%	54.52%	53.71%	52.95%	52.15%	51.54%	51.32%	51.25%	51.02%
1991	0.00%	49.96%	55.26%	53.67%	53.22%	53.03%	51.94%	51.05%	50.11%	49.20%	48.64%	48.46%	48.24%	48.06%	48.02%
1992	0.00%	55.61%	56.25%	56.07%	55.78%	52.99%	50.69%	49.36%	48.31%	47.68%	47.16%	46.83%	46.68%	46.60%	46.54%
1993	21.91%	53.27%	56.16%	55.02%	52.02%	49.09%	47.06%	45.89%	45.03%	44.52%	44.10%	43.94%	43.91%	43.92%	43.94%
1994	45.61%	58.08%	56.17%	51.50%	46.36%	43.96%	42.40%	41.46%	40.84%	40.51%	40.34%	40.31%	40.28%	40.28%	40.33%
1995	34.01%	59.00%	49.24%	43.30%	40.70%	39.65%	38.81%	38.11%	37.77%	37.59%	37.54%	37.50%	37.55%	37.60%	37.66%
1996	41.53%	43.52%	39.62%	37.10%	35.91%	34.79%	33.99%	33.63%	33.61%	33.57%	33.61%	33.68%	33.81%	33.94%	34.05%
1997	33.92%	42.97%	39.58%	36.63%	34.76%	33.44%	33.00%	32.85%	32.82%	32.84%	32.94%	33.13%	33.30%	33.54%	33.72%
1998	51.49%	42.46%	38.10%	34.89%	32.97%	32.33%	32.18%	31.96%	32.08%	32.23%	32.49%	32.74%	33.00%	33.22%	33.49%
1999	24.56%	37.69%	35.01%	31.28%	30.18%	30.03%	30.19%	30.22%	30.64%	31.07%	31.53%	32.15%	32.70%	33.30%	33.83%
2000	0.00%	35.49%	31.16%	31.78%	31.95%	32.37%	32.48%	33.08%	34.12%	34.90%	35.68%	36.47%	37.15%	37.53%	37.69%
2001	0.00%	27.16%	33.44%	33.39%	33.27%	33.58%	34.67%	36.80%	38.67%	40.05%	41.34%	42.15%	42.66%	42.57%	42.70%
2002	0.00%	37.25%	36.19%	34.95%	35.49%	37.28%	40.22%	42.01%	44.01%	45.43%	46.39%	47.04%	47.14%	47.35%	47.55%
2003	6.73%	41.13%	38.29%	37.77%	39.72%	42.45%	44.81%	46.62%	48.04%	49.09%	49.78%	49.85%	49.94%	49.89%	50.04%
2004	38.88%	41.68%	40.35%	43.40%	46.99%	49.57%	51.39%	52.60%	53.77%	54.27%	54.22%	54.17%	54.21%	54.29%	54.33%
2005	54.03%	42.47%	46.82%	51.49%	54.07%	56.48%	57.89%	58.94%	59.17%	58.88%	58.80%	58.78%	58.80%	58.86%	58.88%
2006	40.11%	48.32%	56.82%	60.09%	62.78%	63.83%	64.26%	64.28%	63.73%	63.43%	63.31%	63.22%	63.13%	62.99%	63.02%
2007	0.00%	56.32%	60.02%	63.21%	64.06%	64.53%	64.53%	63.74%	63.42%	63.58%	63.57%	63.54%	63.31%	63.35%	63.35%
2008	0.00%	60.56%	63.30%	65.40%	65.62%	64.91%	62.86%	62.52%	62.34%	61.84%	61.66%	61.60%	61.54%	61.54%	61.51%
2009	69.76%	62.51%	66.14%	65.36%	58.92%	56.57%	55.93%	56.28%	56.14%	56.28%	56.27%	56.13%	56.19%	56.20%	56.22%
2010	51.46%	70.60%	67.24%	61.86%	55.35%	54.39%	54.43%	55.13%	55.30%	55.40%	55.40%	55.40%	55.43%	55.46%	55.53%
2011	10.66%	68.08%	62.22%	53.12%	50.82%	51.69%	52.14%	52.48%	52.49%	52.34%	52.33%	52.45%	52.62%	52.86%	52.93%
2012	0.00%	63.21%	50.69%	50.70%	50.45%	49.23%	48.40%	48.44%	48.38%	48.78%	49.03%	48.94%	49.06%	49.18%	49.14%
2013	0.00%	29.84%	33.66%	43.24%	43.41%	43.03%	41.37%	41.17%	41.89%	54.85%	55.21%	55.20%	55.10%	55.19%	55.38%
2014	0.00%	25.66%	38.21%	39.79%	40.54%	40.20%	41.80%	44.79%	46.02%	46.38%	46.87%	47.11%	47.50%	47.95%	48.00%
2015	0.00%	11.35%	43.26%	38.35%	38.67%	37.45%	42.31%	43.29%	43.54%	45.50%	45.94%	46.16%	46.45%	46.54%	46.63%
2016	0.00%	0.00%	5.49%	38.61%	35.63%	39.85%	45.36%	47.54%	50.26%	50.77%	52.36%	52.83%	53.70%	54.01%	54.42%
2017	0.00%	0.00%	49.08%	33.74%	56.58%	57.19%	59.53%	60.25%	61.63%	61.40%	60.57%	60.57%	61.10%	61.10%	61.11%
2018	0.00%	0.00%	0.00%	70.49%	67.34%	66.22%	66.10%	65.91%	65.33%	64.70%	64.86%	64.96%	64.96%	64.94%	64.83%
2019	0.00%	0.00%	71.79%	66.43%	67.57%	66.36%	65.35%	65.63%	66.72%	66.87%	66.27%	66.41%	66.32%	66.45%	66.33%
2020	0.00%	56.60%	67.88%	67.72%	66.44%	68.71%	68.71%	68.71%	68.71%	68.71%	68.71%	68.71%	68.71%	68.71%	68.32%

	Evaluation Year														
Fiscal Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1990	51.07%	51.05%	50.95%	50.95%	50.95%	50.98%	50.97%	50.97%	50.97%	50.91%	50.91%	50.89%	50.89%	50.90%	50.90%
1991	48.01%	48.02%	48.05%	48.07%	48.14%	48.16%	48.18%	48.17%	48.16%	48.13%	48.13%	48.11%	48.10%	48.10%	48.10%
1992	46.52%	46.53%	46.55%	46.59%	46.61%	46.61%	46.61%	46.60%	46.57%	46.57%	46.55%	46.52%	46.53%	46.53%	46.53%
1993	43.97%	43.97%	44.02%	44.05%	44.05%	44.05%	44.05%	44.04%	44.03%	44.02%	44.03%	44.02%	44.03%	44.03%	44.04%
1994	40.34%	40.40%	40.44%	40.47%	40.50%	40.48%	40.49%	40.49%	40.49%	40.48%	40.48%	40.48%	40.48%	40.49%	40.49%
1995	37.74%	37.80%	37.84%	37.90%	37.93%	37.96%	38.00%	38.02%	38.02%	38.03%	38.03%	38.03%	38.04%	38.04%	38.04%
1996	34.17%	34.26%	34.31%	34.39%	34.45%	34.54%	34.55%	34.56%	34.55%	34.55%	34.56%	34.57%	34.57%	34.57%	34.57%
1997	33.85%	33.99%	34.06%	34.15%	34.26%	34.30%	34.31%	34.31%	34.32%	34.33%	34.35%	34.36%	34.37%	34.37%	34.38%
1998	33.70%	33.79%	33.85%	34.05%	34.07%	34.08%	34.07%	34.08%	34.10%	34.11%	34.12%	34.13%	34.13%	34.13%	34.13%
1999	33.94%	34.10%	34.19%	34.31%	34.32%	34.35%	34.38%	34.44%	34.47%	34.49%	34.49%	34.50%	34.51%	34.51%	34.51%
2000	37.84%	38.07%	38.20%	38.17%	38.18%	38.20%	38.24%	38.27%	38.30%	38.31%	38.32%	38.34%	38.35%	38.35%	38.36%
2001	42.79%	42.76%	42.68%	42.70%	42.69%	42.69%	42.76%	42.81%	42.84%	42.84%	42.85%	42.85%	42.85%	42.85%	42.86%
2002	47.65%	47.68%	47.64%	47.64%	47.67%	47.67%	47.69%	47.70%	47.70%	47.71%	47.71%	47.72%	47.72%	47.72%	47.72%
2003	50.09%	50.10%	50.09%	50.10%	50.13%	50.13%	50.15%	50.15%	50.16%	50.17%	50.17%	50.17%	50.18%	50.18%	50.18%
2004	54.31%	54.32%	54.34%	54.34%	54.34%	54.36%	54.37%	54.37%	54.37%	54.38%	54.38%	54.38%	54.38%	54.38%	54.38%
2005	58.86%	58.87%	58.88%	58.90%	58.90%	58.91%	58.93%	58.93%	58.93%	58.93%	58.93%	58.93%	58.93%	58.93%	58.93%
2006	63.03%	63.05%	63.05%	63.04%	63.03%	63.03%	63.03%	63.03%	63.04%	63.03%	63.03%	63.04%	63.04%	63.04%	63.04%
2007	63.37%	63.38%	63.38%	63.36%	63.40%	63.42%	63.41%	63.40%	63.39%	63.39%	63.37%	63.38%	63.38%	63.38%	63.38%
2008	61.49%	61.52%	61.53%	61.55%	61.54%	61.54%	61.55%	61.56%	61.56%	61.55%	61.56%	61.56%	61.56%	61.56%	61.56%
2009	56.25%	56.24%	56.25%	56.30%	56.31%	56.33%	56.34%	56.34%	56.34%	56.34%	56.34%	56.35%	56.35%	56.35%	56.35%
2010	55.61%	55.63%	55.66%	55.68%	55.69%	55.71%	55.70%	55.70%	55.71%	55.71%	55.70%	55.70%	55.70%	55.70%	55.71%
2011	52.97%	52.99%	52.99%	53.01%	53.01%	53.02%	53.00%	53.00%	53.00%	53.00%	53.01%	53.01%	53.01%	53.01%	53.01%
2012	49.26%	49.35%	49.36%	49.38%	49.37%	49.38%	49.39%	49.39%	49.39%	49.39%	49.39%	49.41%	49.41%	49.41%	49.41%
2013	55.32%	55.41%	55.38%	55.34%	55.24%	55.24%	55.24%	55.20%	55.18%	55.18%	55.18%	55.18%	55.18%	55.18%	55.18%
2014	47.91%	47.91%	47.90%	47.90%	47.94%	47.94%	47.96%	48.01%	48.01%	48.01%	48.01%	48.01%	48.01%	48.01%	48.03%
2015	46.67%	47.14%	47.14%	47.14%	47.27%	47.47%	47.47%	47.47%	47.47%	47.47%	47.47%	47.47%	47.49%	47.49%	47.49%
2016	54.93%	54.78%	54.78%	54.98%	54.98%	54.98%	55.00%	55.00%	55.00%	55.00%	55.00%	55.00%	55.00%	55.00%	55.00%
2017	61.52%	60.98%	60.93%	60.93%	60.93%	60.93%	60.93%	60.93%	60.93%	60.93%	60.93%	60.93%	60.93%	60.93%	60.93%
2018	64.76%	64.76%	64.74%	64.74%	64.74%	64.74%	64.74%	64.74%	64.74%	64.74%	64.74%	64.76%	64.76%	64.76%	64.76%
2019	66.31%	66.31%	66.31%	66.31%	66.31%	66.31%	66.31%	66.31%	66.31%	66.31%	66.31%	66.37%	66.37%	66.37%	66.37%
2020	69.30%	69.30%	69.30%	69.30%	69.30%	69.30%	69.30%	69.30%	69.30%	69.30%	69.30%	69.30%	69.30%	69.30%	69.30%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Active Loans
FRM15

Table 1: Number of Loans Active at the End of Each Evaluation Year

	Evaluation Year															
Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1990	26,921	26,161	23,761	18,337	13,748	12,318	10,593	9,342	7,935	6,663	5,830	5,051	4,214	3,360	2,470	318
1991	29,468	28,170	23,138	17,556	15,772	13,607	11,926	9,947	8,096	7,064	6,072	4,958	3,892	3,146	2,316	257
1992	41,059	38,180	32,616	29,998	26,419	23,453	19,657	16,031	14,102	11,991	9,513	7,229	5,629	4,420	3,138	224
1993	116,811	109,498	103,092	93,669	84,805	73,504	61,526	54,630	47,053	38,340	28,532	22,627	18,213	14,233	10,341	660
1994	143,241	137,352	127,070	116,698	103,100	88,597	79,374	69,271	57,672	44,603	35,714	29,385	23,698	19,050	11,594	331
1995	18,057	16,906	15,599	13,560	11,491	10,337	8,956	7,434	5,894	4,890	4,151	3,576	3,059	2,587	1,727	112
1996	31,745	30,401	27,432	23,583	21,213	18,400	15,074	11,259	8,916	7,390	6,120	5,238	4,439	3,624	2,523	92
1997	20,055	18,671	16,239	14,829	13,029	10,586	7,960	6,354	5,267	4,497	3,810	3,353	2,916	2,494	1,800	124
1998	36,525	34,390	32,100	28,745	24,017	17,320	13,607	11,254	9,501	8,243	7,178	6,317	5,477	4,554	3,368	289
1999	43,371	41,691	37,905	32,262	23,856	18,871	15,705	13,478	11,879	10,604	9,409	8,461	7,298	6,084	4,302	116
2000	10,197	8,822	6,784	4,607	3,487	2,819	2,353	2,024	1,808	1,637	1,458	1,336	1,215	1,015	730	44
2001	25,106	22,445	15,067	11,148	8,817	7,489	6,563	5,824	5,297	4,795	4,293	3,836	3,345	2,784	2,055	233
2002	46,782	37,669	30,216	24,759	21,335	18,920	17,161	15,720	14,391	13,092	11,641	10,202	8,824	7,193	5,081	450
2003	59,594	53,429	45,995	40,300	36,135	32,986	30,311	27,922	25,597	23,185	20,210	17,829	15,219	12,239	8,239	11
2004	52,263	46,736	41,364	37,396	34,522	32,183	29,889	27,737	25,480	22,702	19,997	17,709	15,008	11,831	5,796	20
2005	19,801	18,011	16,287	14,982	13,976	13,017	12,107	11,196	10,160	9,118	7,853	6,941	5,948	4,731	2,960	91
2006	10,420	9,413	8,425	7,536	6,870	6,344	5,796	5,172	4,708	4,214	3,677	3,244	2,772	2,297	1,433	10
2007	7,224	6,428	5,428	4,823	4,400	3,929	3,426	3,038	2,739	2,437	2,129	1,861	1,645	1,377	897	3
2008	24,117	20,750	18,233	16,262	14,159	11,814	10,360	9,212	8,147	7,260	6,406	5,731	4,981	4,123	3,014	26
2009	59,685	55,673	49,780	42,259	34,228	30,006	26,152	22,974	20,236	17,905	15,807	13,780	11,455	9,261	6,172	50
2010	84,857	79,565	69,364	57,592	51,083	44,657	39,034	34,251	30,378	27,096	23,581	19,861	16,275	12,781	7,892	32
2011	87,603	76,621	64,000	56,816	49,177	42,543	36,868	32,600	28,942	25,068	21,279	17,995	14,574	11,577	7,302	44
2012	99,358	90,189	81,746	72,618	63,927	56,466	50,690	45,796	40,122	34,153	28,927	24,165	19,650	15,352	9,434	22
2013	65,580	62,329	56,934	51,372	46,115	41,630	37,757	33,292	28,712	24,890	21,098	17,873	14,671	11,422	6,913	106
2014	29,419	25,929	22,418	19,264	16,886	14,925	12,948	11,489	10,135	8,967	7,756	6,705	5,634	4,531	2,812	60
2015	29,689	26,595	22,932	19,799	17,328	14,898	12,984	11,469	10,053	8,874	7,722	6,621	5,463	4,299	2,692	73
2016	31,079	28,193	24,733	21,847	18,620	16,183	14,339	12,611	11,088	9,737	8,380	7,155	5,860	4,553	2,889	59
2017	32,209	29,157	25,663	21,712	18,839	16,540	14,509	12,781	11,311	9,899	8,453	7,085	5,732	4,471	2,727	53
2018	20,381	18,157	14,519	12,511	10,842	9,372	8,214	7,226	6,310	5,516	4,719	4,010	3,285	2,605	1,548	45
2019	15,541	12,278	10,505	9,028	7,753	6,726	5,892	5,121	4,432	3,848	3,177	2,685	2,174	1,679	985	20
2020	11,837	10,666	9,315	8,050	7,026	6,122	5,312	4,584	3,942	3,364	2,858	2,380	1,931	1,485	846	11

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Conditional Claim Rate
FRM15

Table 2: Number of Claims in Each Evaluation Year

	Evaluation Year															
Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1990	0	41	147	209	204	201	134	88	59	41	36	12	5	7	4	1
1991	1	32	121	156	188	158	106	75	55	28	14	7	4	4	6	2
1992	0	21	92	99	116	79	84	50	30	22	9	5	6	3	2	0
1993	0	47	160	193	193	172	122	101	54	38	24	18	9	6	4	1
1994	5	98	270	336	345	263	206	107	89	53	35	18	17	9	4	1
1995	3	19	54	80	69	58	34	27	26	18	5	10	3	2	1	0
1996	0	19	70	100	105	86	64	45	33	25	17	11	1	3	3	2
1997	0	12	53	71	69	43	25	21	25	17	7	1	4	2	4	0
1998	0	11	71	66	96	67	46	36	15	17	6	12	12	1	6	1
1999	0	15	66	85	110	83	48	22	19	16	17	14	10	11	12	2
2000	0	6	42	72	61	31	29	13	11	14	11	5	4	3	5	2
2001	0	21	77	98	78	54	28	16	26	27	24	10	13	10	12	3
2002	1	37	112	104	87	50	39	33	41	50	33	43	18	24	30	6
2003	0	39	85	90	64	78	80	95	86	83	89	70	45	54	25	7
2004	8	47	103	103	98	109	148	116	125	110	86	73	70	34	18	2
2005	1	64	135	119	127	123	89	70	87	68	67	56	37	15	9	2
2006	3	103	138	158	128	91	93	101	69	63	47	49	23	10	9	0
2007	2	63	149	137	87	119	139	85	66	65	42	27	18	9	4	1
2008	3	91	268	256	328	489	312	216	181	127	69	58	24	6	6	8
2009	7	120	187	323	534	408	401	262	172	111	73	38	23	15	14	3
2010	1	45	161	307	283	276	238	177	111	72	46	27	16	23	15	2
2011	1	40	131	159	169	153	112	91	56	26	19	22	18	12	7	1
2012	1	34	82	103	119	103	64	44	27	27	17	21	13	15	15	1
2013	0	9	46	65	89	57	46	33	25	28	24	12	12	15	9	2
2014	0	13	22	53	53	32	18	17	24	20	11	12	10	8	5	2
2015	0	10	29	42	35	31	21	26	29	18	18	11	6	7	4	1
2016	1	6	36	44	31	25	36	36	28	26	18	10	10	4	5	2
2017	0	8	31	22	16	31	26	28	28	22	20	15	12	8	5	1
2018	0	10	15	20	29	41	39	21	17	9	16	10	11	1	1	1
2019	0	4	17	26	34	35	31	20	22	14	11	4	2	2	2	2
2020	0	6	20	23	20	28	14	13	13	8	6	6	5	3	0	2

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Conditional Claim Rate
FRM15

Table 3: Conditional Claim Rate = Table 2 / Table 1
Percentage of Active Loans at the Beginnng of the Evaluation Year that end in Claim During the Evaluation Year

	Evaluation Year															
Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1990	0.00%	0.16%	0.62%	1.14%	1.48%	1.63%	1.26%	0.94%	0.74%	0.62%	0.62%	0.24%	0.12%	0.21%	0.16%	0.31%
1991	0.00%	0.11%	0.52%	0.89%	1.19%	1.16%	0.89%	0.75%	0.68%	0.40%	0.23%	0.14%	0.10%	0.13%	0.26%	0.78%
1992	0.00%	0.06%	0.28%	0.33%	0.44%	0.34%	0.43%	0.31%	0.21%	0.18%	0.09%	0.07%	0.11%	0.07%	0.06%	0.00%
1993	0.00%	0.04%	0.16%	0.21%	0.23%	0.23%	0.20%	0.18%	0.11%	0.10%	0.08%	0.08%	0.05%	0.04%	0.04%	0.15%
1994	0.00%	0.07%	0.21%	0.29%	0.33%	0.30%	0.26%	0.15%	0.15%	0.12%	0.10%	0.06%	0.07%	0.05%	0.03%	0.30%
1995	0.02%	0.11%	0.35%	0.59%	0.60%	0.56%	0.38%	0.36%	0.44%	0.37%	0.12%	0.28%	0.10%	0.08%	0.06%	0.00%
1996	0.00%	0.06%	0.26%	0.42%	0.49%	0.47%	0.42%	0.40%	0.37%	0.34%	0.28%	0.21%	0.02%	0.08%	0.12%	2.17%
1997	0.00%	0.06%	0.33%	0.48%	0.53%	0.41%	0.31%	0.33%	0.47%	0.38%	0.18%	0.03%	0.14%	0.08%	0.22%	0.00%
1998	0.00%	0.03%	0.22%	0.23%	0.40%	0.39%	0.34%	0.32%	0.16%	0.21%	0.08%	0.19%	0.22%	0.02%	0.18%	0.35%
1999	0.00%	0.04%	0.17%	0.26%	0.46%	0.44%	0.31%	0.16%	0.16%	0.15%	0.18%	0.17%	0.14%	0.18%	0.28%	1.72%
2000	0.00%	0.07%	0.62%	1.56%	1.75%	1.10%	1.23%	0.64%	0.61%	0.86%	0.75%	0.37%	0.33%	0.30%	0.68%	4.55%
2001	0.00%	0.09%	0.51%	0.88%	0.88%	0.72%	0.43%	0.27%	0.49%	0.56%	0.56%	0.26%	0.39%	0.36%	0.58%	1.29%
2002	0.00%	0.10%	0.37%	0.42%	0.41%	0.26%	0.23%	0.21%	0.28%	0.38%	0.28%	0.42%	0.20%	0.33%	0.59%	1.33%
2003	0.00%	0.07%	0.18%	0.22%	0.18%	0.24%	0.26%	0.34%	0.34%	0.36%	0.44%	0.39%	0.30%	0.44%	0.30%	63.64%
2004	0.02%	0.10%	0.25%	0.28%	0.28%	0.34%	0.50%	0.42%	0.49%	0.48%	0.43%	0.41%	0.47%	0.29%	0.31%	10.00%
2005	0.01%	0.36%	0.83%	0.79%	0.91%	0.94%	0.74%	0.63%	0.86%	0.75%	0.85%	0.81%	0.62%	0.32%	0.30%	2.20%
2006	0.03%	1.09%	1.64%	2.10%	1.86%	1.43%	1.60%	1.95%	1.47%	1.50%	1.28%	1.51%	0.83%	0.44%	0.63%	0.00%
2007	0.03%	0.98%	2.75%	2.84%	1.98%	3.03%	4.06%	2.80%	2.41%	2.67%	1.97%	1.45%	1.09%	0.65%	0.45%	33.33%
2008	0.01%	0.44%	1.47%	1.57%	2.32%	4.14%	3.01%	2.34%	2.22%	1.75%	1.08%	1.01%	0.48%	0.15%	0.20%	30.77%
2009	0.01%	0.22%	0.38%	0.76%	1.56%	1.36%	1.53%	1.14%	0.85%	0.62%	0.46%	0.28%	0.20%	0.16%	0.23%	6.00%
2010	0.00%	0.06%	0.23%	0.53%	0.55%	0.62%	0.61%	0.52%	0.37%	0.27%	0.20%	0.14%	0.10%	0.18%	0.19%	6.25%
2011	0.00%	0.05%	0.20%	0.28%	0.34%	0.36%	0.30%	0.28%	0.19%	0.10%	0.09%	0.12%	0.12%	0.10%	0.10%	2.27%
2012	0.00%	0.04%	0.10%	0.14%	0.19%	0.18%	0.13%	0.10%	0.07%	0.08%	0.06%	0.09%	0.07%	0.10%	0.16%	4.55%
2013	0.00%	0.01%	0.08%	0.13%	0.19%	0.14%	0.12%	0.10%	0.09%	0.11%	0.11%	0.07%	0.08%	0.13%	0.13%	1.89%
2014	0.00%	0.05%	0.10%	0.28%	0.31%	0.21%	0.14%	0.15%	0.24%	0.22%	0.14%	0.18%	0.18%	0.18%	0.18%	3.33%
2015	0.00%	0.04%	0.13%	0.21%	0.20%	0.21%	0.16%	0.23%	0.29%	0.20%	0.23%	0.17%	0.11%	0.16%	0.15%	1.37%
2016	0.00%	0.02%	0.15%	0.20%	0.17%	0.15%	0.25%	0.29%	0.25%	0.27%	0.21%	0.14%	0.17%	0.09%	0.17%	3.39%
2017	0.00%	0.03%	0.12%	0.10%	0.08%	0.19%	0.18%	0.22%	0.25%	0.22%	0.24%	0.21%	0.21%	0.18%	0.18%	1.89%
2018	0.00%	0.06%	0.10%	0.16%	0.27%	0.44%	0.47%	0.29%	0.27%	0.16%	0.34%	0.25%	0.33%	0.04%	0.06%	2.22%
2019	0.00%	0.03%	0.16%	0.29%	0.44%	0.52%	0.53%	0.39%	0.50%	0.36%	0.35%	0.15%	0.09%	0.12%	0.20%	10.00%
2020	0.00%	0.06%	0.21%	0.29%	0.28%	0.46%	0.26%	0.28%	0.33%	0.24%	0.21%	0.25%	0.26%	0.20%	0.00%	18.18%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Cumulative Claim Rate
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Table 4: Cumulative Number of Claims as of Each Evaluation Year
Total Number of Claims for each Fiscal Year as of the End of the Evaluation Year

	Evaluation Year															
Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1990	0	41	188	397	601	802	936	1,024	1,083	1,124	1,160	1,172	1,177	1,184	1,188	1,189
1991	1	33	154	310	498	656	762	837	892	920	934	941	945	949	955	957
1992	0	21	113	212	328	407	491	541	571	593	602	607	613	616	618	618
1993	0	47	207	400	593	765	887	988	1,042	1,080	1,104	1,122	1,131	1,137	1,141	1,142
1994	5	103	373	709	1,054	1,317	1,523	1,630	1,719	1,772	1,807	1,825	1,842	1,851	1,855	1,856
1995	3	22	76	156	225	283	317	344	370	388	393	403	406	408	409	409
1996	0	19	89	189	294	380	444	489	522	547	564	575	576	579	582	584
1997	0	12	65	136	205	248	273	294	319	336	343	344	348	350	354	354
1998	0	11	82	148	244	311	357	393	408	425	431	443	455	456	462	463
1999	0	15	81	166	276	359	407	429	448	464	481	495	505	516	528	530
2000	0	6	48	120	181	212	241	254	265	279	290	295	299	302	307	309
2001	0	21	98	196	274	328	356	372	398	425	449	459	472	482	494	497
2002	1	38	150	254	341	391	430	463	504	554	587	630	648	672	702	708
2003	0	39	124	214	278	356	436	531	617	700	789	859	904	958	983	990
2004	8	55	158	261	359	468	616	732	857	967	1,053	1,126	1,196	1,230	1,248	1,250
2005	1	65	200	319	446	569	658	728	815	883	950	1,006	1,043	1,058	1,067	1,069
2006	3	106	244	402	530	621	714	815	884	947	994	1,043	1,066	1,076	1,085	1,085
2007	2	65	214	351	438	557	696	781	847	912	954	981	999	1,008	1,012	1,013
2008	3	94	362	618	946	1,435	1,747	1,963	2,144	2,271	2,340	2,398	2,422	2,428	2,434	2,442
2009	7	127	314	637	1,171	1,579	1,980	2,242	2,414	2,525	2,598	2,636	2,659	2,674	2,688	2,691
2010	1	46	207	514	797	1,073	1,311	1,488	1,599	1,671	1,717	1,744	1,760	1,783	1,798	1,800
2011	1	41	172	331	500	653	765	856	912	938	957	979	997	1,009	1,016	1,017
2012	1	35	117	220	339	442	506	550	577	604	621	642	655	670	685	686
2013	0	9	55	120	209	266	312	345	370	398	422	434	446	461	470	472
2014	0	13	35	88	141	173	191	208	232	252	263	275	285	293	298	300
2015	0	10	39	81	116	147	168	194	223	241	259	270	276	283	287	288
2016	1	7	43	87	118	143	179	215	243	269	287	297	307	311	316	318
2017	0	8	39	61	77	108	134	162	190	212	232	247	259	267	272	273
2018	0	10	25	45	74	115	154	175	192	201	217	227	238	239	240	241
2019	0	4	21	47	81	116	147	167	189	203	214	218	220	222	224	226
2020	0	6	26	49	69	97	111	124	137	145	151	157	162	165	165	167

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Cumulative Claim Rate
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Table 5: Cumulative Claim Rate = Table 4 / Table 1 (Evaluation Year 1)
Cumulative Claims as of Evaluation Year Divided by Active Loans as of Evaluation Year 1

	Evaluation Year															
Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1990	0.00%	0.15%	0.70%	1.47%	2.23%	2.98%	3.48%	3.80%	4.02%	4.18%	4.31%	4.35%	4.37%	4.40%	4.41%	4.42%
1991	0.00%	0.11%	0.52%	1.05%	1.69%	2.23%	2.59%	2.84%	3.03%	3.12%	3.17%	3.19%	3.21%	3.22%	3.24%	3.25%
1992	0.00%	0.05%	0.28%	0.52%	0.80%	0.99%	1.20%	1.32%	1.39%	1.44%	1.47%	1.48%	1.49%	1.50%	1.51%	1.51%
1993	0.00%	0.04%	0.18%	0.34%	0.51%	0.65%	0.76%	0.85%	0.89%	0.92%	0.95%	0.96%	0.97%	0.97%	0.98%	0.98%
1994	0.00%	0.07%	0.26%	0.49%	0.74%	0.92%	1.06%	1.14%	1.20%	1.24%	1.26%	1.27%	1.29%	1.29%	1.30%	1.30%
1995	0.02%	0.12%	0.42%	0.86%	1.25%	1.57%	1.76%	1.91%	2.05%	2.15%	2.18%	2.23%	2.25%	2.26%	2.27%	2.27%
1996	0.00%	0.06%	0.28%	0.60%	0.93%	1.20%	1.40%	1.54%	1.64%	1.72%	1.78%	1.81%	1.81%	1.82%	1.83%	1.84%
1997	0.00%	0.06%	0.32%	0.68%	1.02%	1.24%	1.36%	1.47%	1.59%	1.68%	1.71%	1.72%	1.74%	1.75%	1.77%	1.77%
1998	0.00%	0.03%	0.22%	0.41%	0.67%	0.85%	0.98%	1.08%	1.12%	1.16%	1.18%	1.21%	1.25%	1.25%	1.26%	1.27%
1999	0.00%	0.03%	0.19%	0.38%	0.64%	0.83%	0.94%	0.99%	1.03%	1.07%	1.11%	1.14%	1.16%	1.19%	1.22%	1.22%
2000	0.00%	0.06%	0.47%	1.18%	1.78%	2.08%	2.36%	2.49%	2.60%	2.74%	2.84%	2.89%	2.93%	2.96%	3.01%	3.03%
2001	0.00%	0.08%	0.39%	0.78%	1.09%	1.31%	1.42%	1.48%	1.59%	1.69%	1.79%	1.83%	1.88%	1.92%	1.97%	1.98%
2002	0.00%	0.08%	0.32%	0.54%	0.73%	0.84%	0.92%	0.99%	1.08%	1.18%	1.25%	1.35%	1.39%	1.44%	1.50%	1.51%
2003	0.00%	0.07%	0.21%	0.36%	0.47%	0.60%	0.73%	0.89%	1.04%	1.17%	1.32%	1.44%	1.52%	1.61%	1.65%	1.66%
2004	0.02%	0.11%	0.30%	0.50%	0.69%	0.90%	1.18%	1.40%	1.64%	1.85%	2.01%	2.15%	2.29%	2.35%	2.39%	2.39%
2005	0.01%	0.33%	1.01%	1.61%	2.25%	2.87%	3.32%	3.68%	4.12%	4.46%	4.80%	5.08%	5.27%	5.34%	5.39%	5.40%
2006	0.03%	1.02%	2.34%	3.86%	5.09%	5.96%	6.85%	7.82%	8.48%	9.09%	9.54%	10.01%	10.23%	10.33%	10.41%	10.41%
2007	0.03%	0.90%	2.96%	4.86%	6.06%	7.71%	9.63%	10.81%	11.72%	12.62%	13.21%	13.58%	13.83%	13.95%	14.01%	14.02%
2008	0.01%	0.39%	1.50%	2.56%	3.92%	5.95%	7.24%	8.14%	8.89%	9.42%	9.70%	9.94%	10.04%	10.07%	10.09%	10.13%
2009	0.01%	0.21%	0.53%	1.07%	1.96%	2.65%	3.32%	3.76%	4.04%	4.23%	4.35%	4.42%	4.46%	4.48%	4.50%	4.51%
2010	0.00%	0.05%	0.24%	0.61%	0.94%	1.26%	1.54%	1.75%	1.88%	1.97%	2.02%	2.06%	2.07%	2.10%	2.12%	2.12%
2011	0.00%	0.05%	0.20%	0.38%	0.57%	0.75%	0.87%	0.98%	1.04%	1.07%	1.09%	1.12%	1.14%	1.15%	1.16%	1.16%
2012	0.00%	0.04%	0.12%	0.22%	0.34%	0.44%	0.51%	0.55%	0.58%	0.61%	0.63%	0.65%	0.66%	0.67%	0.69%	0.69%
2013	0.00%	0.01%	0.08%	0.18%	0.32%	0.41%	0.48%	0.53%	0.56%	0.61%	0.64%	0.66%	0.68%	0.70%	0.72%	0.72%
2014	0.00%	0.04%	0.12%	0.30%	0.48%	0.59%	0.65%	0.71%	0.79%	0.86%	0.89%	0.93%	0.97%	1.00%	1.01%	1.02%
2015	0.00%	0.03%	0.13%	0.27%	0.39%	0.50%	0.57%	0.65%	0.75%	0.81%	0.87%	0.91%	0.93%	0.95%	0.97%	0.97%
2016	0.00%	0.02%	0.14%	0.28%	0.38%	0.46%	0.58%	0.69%	0.78%	0.87%	0.92%	0.96%	0.99%	1.00%	1.02%	1.02%
2017	0.00%	0.02%	0.12%	0.19%	0.24%	0.34%	0.42%	0.50%	0.59%	0.66%	0.72%	0.77%	0.80%	0.83%	0.84%	0.85%
2018	0.00%	0.05%	0.12%	0.22%	0.36%	0.56%	0.76%	0.86%	0.94%	0.99%	1.06%	1.11%	1.17%	1.17%	1.18%	1.18%
2019	0.00%	0.03%	0.14%	0.30%	0.52%	0.75%	0.95%	1.07%	1.22%	1.31%	1.38%	1.40%	1.42%	1.43%	1.44%	1.45%
2020	0.00%	0.05%	0.22%	0.41%	0.58%	0.82%	0.94%	1.05%	1.16%	1.22%	1.28%	1.33%	1.37%	1.39%	1.39%	1.41%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Conditional Non-Claim Termination Rate
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Table 6: Number of Non-Claim Terminations in Each Evaluation Year

	Evaluation Year														
Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1990	107	719	2,253	5,215	4,385	1,228	1,591	1,162	1,346	1,230	772	762	830	836	744
1991	130	1,266	4,911	5,426	1,596	2,007	1,575	1,903	1,796	1,000	960	1,103	1,061	733	723
1992	213	2,858	5,472	2,519	3,463	2,887	3,712	3,576	1,898	2,086	2,430	2,279	1,589	1,203	1,211
1993	1,143	7,266	6,246	9,230	8,670	11,126	11,855	6,792	7,515	8,671	9,642	5,875	4,386	3,965	3,548
1994	1,949	5,791	10,012	10,036	13,250	14,236	9,004	9,979	11,474	12,901	8,479	6,258	5,589	4,571	5,272
1995	195	1,132	1,253	1,959	2,000	1,094	1,346	1,491	1,513	966	668	552	509	403	434
1996	238	1,325	2,899	3,749	2,265	2,727	3,262	3,770	2,310	1,497	1,180	863	789	793	986
1997	161	1,372	2,379	1,339	1,731	2,398	2,601	1,584	1,060	747	559	450	408	406	543
1998	306	2,124	2,219	3,289	4,632	6,630	3,666	2,315	1,736	1,227	991	838	821	910	1,066
1999	410	1,665	3,720	5,558	8,296	4,902	3,118	2,204	1,575	1,252	1,036	923	1,139	1,193	1,614
2000	88	1,369	1,996	2,105	1,059	637	436	316	204	152	145	111	117	194	202
2001	284	2,640	7,301	3,821	2,253	1,274	898	723	501	474	436	437	475	549	680
2002	750	9,076	7,341	5,353	3,337	2,365	1,720	1,406	1,287	1,245	1,277	1,364	1,355	1,604	1,978
2003	1,824	6,126	7,349	5,605	4,101	3,071	2,595	2,294	2,238	2,321	2,545	2,308	2,556	2,906	3,816
2004	1,895	5,480	5,269	3,865	2,775	2,230	2,146	2,034	2,131	2,508	2,261	2,208	2,615	3,119	3,937
2005	629	1,726	1,589	1,186	877	834	819	833	943	948	883	842	941	1,154	1,419
2006	368	904	850	731	537	435	455	523	395	414	348	383	444	463	635
2007	251	733	851	468	335	352	364	303	233	234	237	241	197	258	404
2008	381	3,276	2,249	1,715	1,775	1,856	1,142	932	884	756	722	616	725	851	1,008
2009	2,140	3,892	5,706	7,198	7,497	3,814	3,453	2,915	2,566	2,201	1,917	1,987	2,294	2,175	2,784
2010	706	5,247	10,040	11,465	6,226	6,149	5,385	4,605	3,762	3,190	3,320	3,689	3,563	3,463	4,326
2011	699	10,942	12,490	7,025	7,470	6,481	5,563	4,177	3,602	3,831	3,563	3,259	3,402	2,981	3,969
2012	1,227	9,135	8,361	9,025	8,572	7,358	5,712	4,850	5,646	5,935	4,962	4,736	4,491	4,276	5,591
2013	651	3,242	5,349	5,497	5,168	4,428	3,827	4,432	4,555	3,777	3,482	3,191	3,174	3,202	4,130
2014	697	3,477	3,489	3,101	2,324	1,929	1,959	1,442	1,330	1,137	1,072	1,023	1,045	1,075	1,517
2015	594	3,084	3,634	3,091	2,436	2,399	1,893	1,489	1,385	1,148	1,050	1,083	1,141	1,138	1,496
2016	584	2,880	3,424	2,842	3,196	2,412	1,808	1,692	1,493	1,319	1,255	1,206	1,275	1,293	1,543
2017	573	3,044	3,463	3,929	2,857	2,268	2,005	1,699	1,441	1,384	1,318	1,341	1,328	1,232	1,587
2018	399	2,214	3,623	1,988	1,640	1,429	1,119	967	899	779	733	692	705	671	955
2019	478	3,259	1,756	1,451	1,241	992	803	750	666	562	595	483	501	484	625
2020	549	1,165	1,331	1,242	1,004	876	795	715	628	566	444	469	435	424	577

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Table 7: Non-Claim Termination Rate = Table 6 / Table 1
Percentage of Active Loans at the Beginnng of the Evaluation Year that end in Termination by Other Than Claim During the Evaluation Year

	Evaluation Year														
Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1990	0.40%	2.75%	9.48%	28.44%	31.90%	9.97%	15.02%	12.44%	16.96%	18.46%	13.24%	15.09%	19.70%	24.88%	30.12%
1991	0.44%	4.49%	21.22%	30.91%	10.12%	14.75%	13.21%	19.13%	22.18%	14.16%	15.81%	22.25%	27.26%	23.30%	31.22%
1992	0.52%	7.49%	16.78%	8.40%	13.11%	12.31%	18.88%	22.31%	13.46%	17.40%	25.54%	31.53%	28.23%	27.22%	38.59%
1993	0.98%	6.64%	6.06%	9.85%	10.22%	15.14%	19.27%	12.43%	15.97%	22.62%	33.79%	25.96%	24.08%	27.86%	34.31%
1994	1.36%	4.22%	7.88%	8.60%	12.85%	16.07%	11.34%	14.41%	19.90%	28.92%	23.74%	21.30%	23.58%	23.99%	45.47%
1995	1.08%	6.70%	8.03%	14.45%	17.40%	10.58%	15.03%	20.06%	25.67%	19.75%	16.09%	15.44%	16.64%	15.58%	25.13%
1996	0.75%	4.36%	10.57%	15.90%	10.68%	14.82%	21.64%	33.48%	25.91%	20.26%	19.28%	16.48%	17.77%	21.88%	39.08%
1997	0.80%	7.35%	14.65%	9.03%	13.29%	22.65%	32.68%	24.93%	20.13%	16.61%	14.67%	13.42%	13.99%	16.28%	30.17%
1998	0.84%	6.18%	6.91%	11.44%	19.29%	38.28%	26.94%	20.57%	18.27%	14.89%	13.81%	13.27%	14.99%	19.98%	31.65%
1999	0.95%	3.99%	9.81%	17.23%	34.78%	25.98%	19.85%	16.35%	13.26%	11.81%	11.01%	10.91%	15.61%	19.61%	37.52%
2000	0.86%	15.52%	29.42%	45.69%	30.37%	22.60%	18.53%	15.61%	11.28%	9.29%	9.95%	8.31%	9.63%	19.11%	27.67%
2001	1.13%	11.76%	48.46%	34.28%	25.55%	17.01%	13.68%	12.41%	9.46%	9.89%	10.16%	11.39%	14.20%	19.72%	33.09%
2002	1.60%	24.09%	24.30%	21.62%	15.64%	12.50%	10.02%	8.94%	8.94%	9.51%	10.97%	13.37%	15.36%	22.30%	38.93%
2003	3.06%	11.47%	15.98%	13.91%	11.35%	9.31%	8.56%	8.22%	8.74%	10.01%	12.59%	12.95%	16.79%	23.74%	46.32%
2004	3.63%	11.73%	12.74%	10.34%	8.04%	6.93%	7.18%	7.33%	8.36%	11.05%	11.31%	12.47%	17.42%	26.36%	67.93%
2005	3.18%	9.58%	9.76%	7.92%	6.28%	6.41%	6.76%	7.44%	9.28%	10.40%	11.24%	12.13%	15.82%	24.39%	47.94%
2006	3.53%	9.60%	10.09%	9.70%	7.82%	6.86%	7.85%	10.11%	8.39%	9.82%	9.46%	11.81%	16.02%	20.16%	44.31%
2007	3.47%	11.40%	15.68%	9.70%	7.61%	8.96%	10.62%	9.97%	8.51%	9.60%	11.13%	12.95%	11.98%	18.74%	45.04%
2008	1.58%	15.79%	12.33%	10.55%	12.54%	15.71%	11.02%	10.12%	10.85%	10.41%	11.27%	10.75%	14.56%	20.64%	33.44%
2009	3.59%	6.99%	11.46%	17.03%	21.90%	12.71%	13.20%	12.69%	12.68%	12.29%	12.13%	14.42%	20.03%	23.49%	45.11%
2010	0.83%	6.59%	14.47%	19.91%	12.19%	13.77%	13.80%	13.44%	12.38%	11.77%	14.08%	18.57%	21.89%	27.09%	54.82%
2011	0.80%	14.28%	19.52%	12.36%	15.19%	15.23%	15.09%	12.81%	12.45%	15.28%	16.74%	18.11%	23.34%	25.75%	54.35%
2012	1.23%	10.13%	10.23%	12.43%	13.41%	13.03%	11.27%	10.59%	14.07%	17.38%	17.15%	19.60%	22.85%	27.85%	59.26%
2013	0.99%	5.20%	9.40%	10.70%	11.21%	10.64%	10.14%	13.31%	15.86%	15.17%	16.50%	17.85%	21.63%	28.03%	59.74%
2014	2.37%	13.41%	15.56%	16.10%	13.76%	12.92%	15.13%	12.55%	13.12%	12.68%	13.82%	15.26%	18.55%	23.73%	53.95%
2015	2.00%	11.60%	15.85%	15.61%	14.06%	16.10%	14.58%	12.98%	13.78%	12.94%	13.60%	16.36%	20.89%	26.47%	55.57%
2016	1.88%	10.22%	13.84%	13.01%	17.16%	14.90%	12.61%	13.42%	13.47%	13.55%	14.98%	16.86%	21.76%	28.40%	53.41%
2017	1.78%	10.44%	13.49%	18.10%	15.17%	13.71%	13.82%	13.29%	12.74%	13.98%	15.59%	18.93%	23.17%	27.56%	58.20%
2018	1.96%	12.19%	24.95%	15.89%	15.13%	15.25%	13.62%	13.38%	14.25%	14.12%	15.53%	17.26%	21.46%	25.76%	61.69%
2019	3.08%	26.54%	16.72%	16.07%	16.01%	14.75%	13.63%	14.65%	15.03%	14.60%	18.73%	17.99%	23.05%	28.83%	63.45%
2020	4.64%	10.92%	14.29%	15.43%	14.29%	14.31%	14.97%	15.60%	15.93%	16.83%	15.54%	19.71%	22.53%	28.55%	68.20%

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Table 8: Cumulative Number of Non-Claim Terminations as of Each Evaluation Year
Total Number of Non-Claim Terminations for each Fiscal Year as of the End of the Evaluation Year

	Evaluation Year															
Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1990	107	826	3,079	8,294	12,679	13,907	15,498	16,660	18,006	19,236	20,008	20,770	21,600	22,436	23,180	23,545
1991	130	1,396	6,307	11,733	13,329	15,336	16,911	18,814	20,610	21,610	22,570	23,673	24,734	25,467	26,190	26,692
1992	213	3,071	8,543	11,062	14,525	17,412	21,124	24,700	26,598	28,684	31,114	33,393	34,982	36,185	37,396	38,119
1993	1,143	8,409	14,655	23,885	32,555	43,681	55,536	62,328	69,843	78,514	88,156	94,031	98,417	102,382	105,930	108,422
1994	1,949	7,740	17,752	27,788	41,038	55,274	64,278	74,257	85,731	98,632	107,111	113,369	118,958	123,529	128,801	130,381
1995	195	1,327	2,580	4,539	6,539	7,633	8,979	10,470	11,983	12,949	13,617	14,169	14,678	15,081	15,515	15,857
1996	238	1,563	4,462	8,211	10,476	13,203	16,465	20,235	22,545	24,042	25,222	26,085	26,874	27,667	28,653	29,243
1997	161	1,533	3,912	5,251	6,982	9,380	11,981	13,565	14,625	15,372	15,931	16,381	16,789	17,195	17,738	18,089
1998	306	2,430	4,649	7,938	12,570	19,200	22,866	25,181	26,917	28,144	29,135	29,973	30,794	31,704	32,770	33,698
1999	410	2,075	5,795	11,353	19,649	24,551	27,669	29,873	31,448	32,700	33,736	34,659	35,798	36,991	38,605	39,509
2000	88	1,457	3,453	5,558	6,617	7,254	7,690	8,006	8,210	8,362	8,507	8,618	8,735	8,929	9,131	9,257
2001	284	2,924	10,225	14,046	16,299	17,573	18,471	19,194	19,695	20,169	20,605	21,042	21,517	22,066	22,746	23,396
2002	750	9,826	17,167	22,520	25,857	28,222	29,942	31,348	32,635	33,880	35,157	36,521	37,876	39,480	41,458	42,971
2003	1,824	7,950	15,299	20,904	25,005	28,076	30,671	32,965	35,203	37,524	40,069	42,377	44,933	47,839	51,655	54,088
2004	1,895	7,375	12,644	16,509	19,284	21,514	23,660	25,694	27,825	30,333	32,594	34,802	37,417	40,536	44,473	45,649
2005	629	2,355	3,944	5,130	6,007	6,841	7,660	8,493	9,436	10,384	11,267	12,109	13,050	14,204	15,623	16,227
2006	368	1,272	2,122	2,853	3,390	3,825	4,280	4,803	5,198	5,612	5,960	6,343	6,787	7,250	7,885	8,123
2007	251	984	1,835	2,303	2,638	2,990	3,354	3,657	3,890	4,124	4,361	4,602	4,799	5,057	5,461	5,636
2008	381	3,657	5,906	7,621	9,396	11,252	12,394	13,326	14,210	14,966	15,688	16,304	17,029	17,880	18,888	19,622
2009	2,140	6,032	11,738	18,936	26,433	30,247	33,700	36,615	39,181	41,382	43,299	45,286	47,580	49,755	52,539	54,181
2010	706	5,953	15,993	27,458	33,684	39,833	45,218	49,823	53,585	56,775	60,095	63,784	67,347	70,810	75,136	77,099
2011	699	11,641	24,131	31,156	38,626	45,107	50,670	54,847	58,449	62,280	65,843	69,102	72,504	75,485	79,454	81,273
2012	1,227	10,362	18,723	27,748	36,320	43,678	49,390	54,240	59,886	65,821	70,783	75,519	80,010	84,286	89,877	92,640
2013	651	3,893	9,242	14,739	19,907	24,335	28,162	32,594	37,149	40,926	44,408	47,599	50,773	53,975	58,105	59,892
2014	697	4,174	7,663	10,764	13,088	15,017	16,976	18,418	19,748	20,885	21,957	22,980	24,025	25,100	26,617	27,280
2015	594	3,678	7,312	10,403	12,839	15,238	17,131	18,620	20,005	21,153	22,203	23,286	24,427	25,565	27,061	27,793
2016	584	3,464	6,888	9,730	12,926	15,338	17,146	18,838	20,331	21,650	22,905	24,111	25,386	26,679	28,222	28,986
2017	573	3,617	7,080	11,009	13,866	16,134	18,139	19,838	21,279	22,663	23,981	25,322	26,650	27,882	29,469	30,205
2018	399	2,613	6,236	8,224	9,864	11,293	12,412	13,379	14,278	15,057	15,790	16,482	17,187	17,858	18,813	19,227
2019	478	3,737	5,493	6,944	8,185	9,177	9,980	10,730	11,396	11,958	12,553	13,036	13,537	14,021	14,646	14,927
2020	549	1,714	3,045	4,287	5,291	6,167	6,962	7,677	8,305	8,871	9,315	9,784	10,219	10,643	11,220	11,423

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Table 9: Cumulative Non-Claim Termination Rate = Table 8 / Table 1 (Evaluation Year 1)
Cumulative Non-Claim Terminations as of Evaluation Year Divided by Active Loans as of Evaluation Year 1

	Evaluation Year															
Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1990	0.40%	3.07%	11.44%	30.81%	47.10%	51.66%	57.57%	61.88%	66.88%	71.45%	74.32%	77.15%	80.23%	83.34%	86.10%	87.46%
1991	0.44%	4.74%	21.40%	39.82%	45.23%	52.04%	57.39%	63.85%	69.94%	73.33%	76.59%	80.33%	83.94%	86.42%	88.88%	90.58%
1992	0.52%	7.48%	20.81%	26.94%	35.38%	42.41%	51.45%	60.16%	64.78%	69.86%	75.78%	81.33%	85.20%	88.13%	91.08%	92.84%
1993	0.98%	7.20%	12.55%	20.45%	27.87%	37.39%	47.54%	53.36%	59.79%	67.21%	75.47%	80.50%	84.25%	87.65%	90.68%	92.82%
1994	1.36%	5.40%	12.39%	19.40%	28.65%	38.59%	44.87%	51.84%	59.85%	68.86%	74.78%	79.15%	83.05%	86.24%	89.92%	91.02%
1995	1.08%	7.35%	14.29%	25.14%	36.21%	42.27%	49.73%	57.98%	66.36%	71.71%	75.41%	78.47%	81.29%	83.52%	85.92%	87.82%
1996	0.75%	4.92%	14.06%	25.87%	33.00%	41.59%	51.87%	63.74%	71.02%	75.73%	79.45%	82.17%	84.66%	87.15%	90.26%	92.12%
1997	0.80%	7.64%	19.51%	26.18%	34.81%	46.77%	59.74%	67.64%	72.92%	76.65%	79.44%	81.68%	83.71%	85.74%	88.45%	90.20%
1998	0.84%	6.65%	12.73%	21.73%	34.41%	52.57%	62.60%	68.94%	73.69%	77.05%	79.77%	82.06%	84.31%	86.80%	89.72%	92.26%
1999	0.95%	4.78%	13.36%	26.18%	45.30%	56.61%	63.80%	68.88%	72.51%	75.40%	77.78%	79.91%	82.54%	85.29%	89.01%	91.10%
2000	0.86%	14.29%	33.86%	54.51%	64.89%	71.14%	75.41%	78.51%	80.51%	82.00%	83.43%	84.52%	85.66%	87.56%	89.55%	90.78%
2001	1.13%	11.65%	40.73%	55.95%	64.92%	70.00%	73.57%	76.45%	78.45%	80.34%	82.07%	83.81%	85.70%	87.89%	90.60%	93.19%
2002	1.60%	21.00%	36.70%	48.14%	55.27%	60.33%	64.00%	67.01%	69.76%	72.42%	75.15%	78.07%	80.96%	84.39%	88.62%	91.85%
2003	3.06%	13.34%	25.67%	35.08%	41.96%	47.11%	51.47%	55.32%	59.07%	62.97%	67.24%	71.11%	75.40%	80.27%	86.68%	90.76%
2004	3.63%	14.11%	24.19%	31.59%	36.90%	41.16%	45.27%	49.16%	53.24%	58.04%	62.37%	66.59%	71.59%	77.56%	85.09%	87.34%
2005	3.18%	11.89%	19.92%	25.91%	30.34%	34.55%	38.68%	42.89%	47.65%	52.44%	56.90%	61.15%	65.91%	71.73%	78.90%	81.95%
2006	3.53%	12.21%	20.36%	27.38%	32.53%	36.71%	41.07%	46.09%	49.88%	53.86%	57.20%	60.87%	65.13%	69.58%	75.67%	77.96%
2007	3.47%	13.62%	25.40%	31.88%	36.52%	41.39%	46.43%	50.62%	53.85%	57.09%	60.37%	63.70%	66.43%	70.00%	75.60%	78.02%
2008	1.58%	15.16%	24.49%	31.60%	38.96%	46.66%	51.39%	55.26%	58.92%	62.06%	65.05%	67.60%	70.61%	74.14%	78.32%	81.36%
2009	3.59%	10.11%	19.67%	31.73%	44.29%	50.68%	56.46%	61.35%	65.65%	69.33%	72.55%	75.88%	79.72%	83.36%	88.03%	90.78%
2010	0.83%	7.02%	18.85%	32.36%	39.70%	46.94%	53.29%	58.71%	63.15%	66.91%	70.82%	75.17%	79.37%	83.45%	88.54%	90.86%
2011	0.80%	13.29%	27.55%	35.56%	44.09%	51.49%	57.84%	62.61%	66.72%	71.09%	75.16%	78.88%	82.76%	86.17%	90.70%	92.77%
2012	1.23%	10.43%	18.84%	27.93%	36.55%	43.96%	49.71%	54.59%	60.27%	66.25%	71.24%	76.01%	80.53%	84.83%	90.46%	93.24%
2013	0.99%	5.94%	14.09%	22.47%	30.36%	37.11%	42.94%	49.70%	56.65%	62.41%	67.72%	72.58%	77.42%	82.30%	88.60%	91.33%
2014	2.37%	14.19%	26.05%	36.59%	44.49%	51.05%	57.70%	62.61%	67.13%	70.99%	74.64%	78.11%	81.66%	85.32%	90.48%	92.73%
2015	2.00%	12.39%	24.63%	35.04%	43.24%	51.33%	57.70%	62.72%	67.38%	71.25%	74.79%	78.43%	82.28%	86.11%	91.15%	93.61%
2016	1.88%	11.15%	22.16%	31.31%	41.59%	49.35%	55.17%	60.61%	65.42%	69.66%	73.70%	77.58%	81.68%	85.84%	90.81%	93.27%
2017	1.78%	11.23%	21.98%	34.18%	43.05%	50.09%	56.32%	61.59%	66.07%	70.36%	74.45%	78.62%	82.74%	86.57%	91.49%	93.78%
2018	1.96%	12.82%	30.60%	40.35%	48.40%	55.41%	60.90%	65.64%	70.06%	73.88%	77.47%	80.87%	84.33%	87.62%	92.31%	94.34%
2019	3.08%	24.05%	35.35%	44.68%	52.67%	59.05%	64.22%	69.04%	73.33%	76.94%	80.77%	83.88%	87.11%	90.22%	94.24%	96.05%
2020	4.64%	14.48%	25.72%	36.22%	44.70%	52.10%	58.82%	64.86%	70.16%	74.94%	78.69%	82.66%	86.33%	89.91%	94.79%	96.50%

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Table 10: Gross Claim Cost in Each Evaluation Year

	Evaluation Year															
Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1990	0	2,168,528	8,763,714	14,848,102	15,087,031	16,949,785	10,910,415	6,055,554	4,176,642	2,957,965	2,615,312	800,792	290,602	410,293	139,077	20,731
1991	136,231	1,886,419	8,167,024	10,980,244	16,198,596	13,544,960	7,717,807	5,824,144	3,789,445	1,786,810	895,402	448,271	195,135	151,639	311,052	45,863
1992	0	1,343,200	4,825,773	6,195,078	7,994,236	4,940,792	4,756,493	2,930,220	1,358,807	1,077,381	424,729	116,601	121,115	64,252	51,128	0
1993	0	2,487,651	9,325,163	12,127,402	11,295,457	9,277,565	6,890,699	5,416,736	2,705,372	1,679,451	726,845	556,879	239,549	174,445	120,610	31,873
1994	325,955	5,174,579	15,170,876	19,228,492	20,125,777	14,416,697	10,202,223	5,095,303	3,889,599	1,944,439	1,133,717	643,993	442,192	187,529	79,338	23,382
1995	137,429	971,586	2,793,684	4,255,452	3,393,157	2,693,227	1,723,302	1,123,384	975,841	564,994	201,697	332,279	78,513	44,432	33,289	0
1996	0	1,041,300	4,008,598	5,820,592	5,299,525	4,359,861	3,275,845	1,910,928	1,552,742	846,531	606,206	382,178	37,557	62,858	82,047	26,062
1997	0	795,031	3,481,783	3,904,536	3,862,416	2,198,578	1,287,706	1,026,028	1,280,162	747,971	204,591	21,375	105,820	105,609	138,584	0
1998	0	506,108	4,588,439	4,123,154	6,025,282	3,393,248	2,538,837	1,817,526	902,044	546,810	227,138	438,303	582,452	14,565	285,462	35,858
1999	0	785,721	4,283,679	4,951,771	6,949,808	4,666,631	2,683,489	1,125,759	827,821	827,459	850,518	544,176	373,107	350,678	512,340	92,445
2000	0	417,225	2,627,898	5,118,965	4,199,612	1,971,958	1,496,279	822,956	554,906	742,428	607,023	184,953	104,164	137,060	190,437	116,131
2001	0	1,556,678	5,955,128	7,352,863	5,635,035	3,799,170	2,247,528	1,111,703	1,654,557	1,332,111	1,309,297	430,724	608,490	625,328	584,703	526,066
2002	3,460	2,268,974	8,803,904	7,946,700	6,882,406	3,413,960	2,527,478	2,324,689	2,310,952	2,804,874	1,774,033	2,311,075	898,260	1,652,608	1,595,154	284,984
2003	0	3,259,540	7,504,361	6,701,792	4,512,474	5,508,972	5,633,949	6,118,987	5,512,608	4,969,980	5,804,432	4,971,093	2,750,738	3,530,623	1,257,557	452,695
2004	590,005	3,456,581	7,630,908	7,579,453	7,289,796	7,537,832	10,054,448	7,365,425	8,394,950	6,281,886	5,764,667	4,013,567	4,326,070	1,158,786	1,261,666	14,864
2005	123,918	6,165,842	11,569,901	10,045,221	10,549,554	10,069,405	7,108,274	4,789,891	6,988,047	5,206,544	4,344,309	3,342,552	1,928,401	682,282	232,529	120,565
2006	380,605	10,137,439	13,537,951	15,554,961	12,626,406	8,185,283	8,631,017	8,530,983	6,588,323	4,990,651	3,719,198	2,598,050	1,470,581	535,527	320,395	0
2007	222,568	6,045,262	14,156,009	13,650,298	8,365,658	12,407,435	13,881,017	7,735,205	5,373,113	5,780,245	3,821,601	1,856,523	1,253,699	440,626	272,230	31,494
2008	431,991	10,502,155	28,704,579	27,763,072	34,283,687	51,479,387	30,183,602	19,826,351	16,203,919	11,685,530	3,489,249	3,774,348	1,625,849	381,368	261,281	300,234
2009	608,657	13,275,539	18,879,150	32,222,585	61,622,052	42,470,038	37,059,403	24,468,454	12,832,358	7,540,408	4,569,234	1,930,407	1,450,593	613,113	520,418	98,929
2010	15,278	4,142,559	15,762,964	31,685,736	28,471,109	27,049,554	20,643,077	11,977,539	7,179,870	3,599,916	2,158,596	2,009,150	826,594	945,504	317,807	29,951
2011	60,641	4,069,712	12,379,373	15,520,124	16,981,992	13,694,941	8,182,272	4,667,614	3,384,052	952,861	1,475,327	1,375,582	943,645	391,249	270,633	99,651
2012	103,845	3,223,324	8,311,758	10,756,227	10,946,634	8,067,743	4,012,452	2,889,462	1,120,832	2,139,820	1,054,355	990,287	828,568	488,000	514,290	59,592
2013	0	962,631	3,518,457	4,960,303	5,698,047	3,527,333	3,054,412	2,132,825	2,281,488	2,138,657	1,283,214	641,345	692,342	753,359	292,248	88,505
2014	0	865,559	1,836,136	4,652,600	4,003,114	1,703,280	962,094	1,396,114	1,679,380	1,486,503	872,011	706,280	431,380	332,667	266,313	13,750
2015	0	708,312	2,035,277	2,449,545	2,142,227	1,574,986	1,959,149	1,886,033	1,967,266	1,038,392	1,057,150	484,885	255,571	410,875	198,832	28,527
2016	107,263	325,902	2,305,673	2,261,396	1,817,764	1,982,789	2,755,178	2,359,719	1,632,617	1,579,156	902,301	452,094	556,947	189,024	235,359	26,353
2017	0	668,151	2,208,100	1,133,581	1,622,420	2,354,333	2,130,598	1,812,002	1,583,541	1,271,842	1,187,029	858,233	605,122	345,955	233,350	43,788
2018	0	604,302	1,021,391	1,653,767	2,308,604	3,005,744	2,692,223	1,625,143	1,512,537	661,885	1,092,516	346,837	648,733	62,325	16,251	30,049
2019	0	178,195	1,763,773	2,217,612	2,627,582	2,408,345	2,167,846	1,289,632	1,969,615	765,615	797,061	354,408	98,133	154,229	58,619	77,443
2020	0	708,607	1,661,098	1,679,454	1,940,462	2,581,409	1,189,993	952,899	1,221,846	781,334	452,138	389,786	391,620	160,379	0	61,246

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Conditional Loss Rate
FRM15

Table 11: Claim Cost Net of Recovery in Each Evaluation Year

	Evaluation Year															
Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1990	0	1,355,718	5,166,962	9,577,641	10,314,347	13,060,906	8,419,627	3,662,183	2,615,340	1,570,490	1,360,768	349,569	122,362	163,991	96,222	19,182
1991	46,891	951,855	4,529,024	6,937,453	12,153,941	10,379,713	4,835,228	3,340,612	2,072,140	908,518	347,106	172,034	29,895	51,919	(136,131)	(9,613)
1992	0	617,859	2,280,752	4,138,880	5,336,518	2,851,796	2,381,209	1,314,941	577,428	505,450	127,158	32,264	26,826	61,222	59,221	0
1993	0	1,338,268	5,828,008	6,590,116	5,137,706	3,441,287	3,051,653	2,197,158	953,146	600,712	187,852	244,113	7,977	92,452	100,479	(458)
1994	95,848	2,783,429	8,494,430	8,421,910	7,577,776	5,439,398	3,873,778	1,825,826	1,499,772	634,015	433,059	320,564	312,093	178,281	40,704	15,323
1995	47,920	283,239	1,003,106	1,595,129	1,232,106	942,993	480,932	412,936	242,160	192,646	76,915	204,506	43,033	47,684	(5,022)	0
1996	0	447,824	1,470,049	2,039,818	2,303,738	1,430,511	926,304	603,407	650,601	437,181	304,831	240,778	27,397	21,413	13,383	27,274
1997	0	285,939	1,194,443	1,530,560	1,626,493	751,308	544,505	461,198	329,666	261,699	98,090	23,843	62,111	43,891	22,540	0
1998	0	188,031	1,533,596	1,347,850	2,097,206	1,159,268	826,010	733,161	489,778	252,221	89,196	221,529	414,307	0	224,110	0
1999	0	303,212	1,251,676	1,725,734	2,271,989	1,638,328	1,116,574	544,829	479,316	362,372	482,095	357,850	179,834	201,570	234,087	18,769
2000	0	143,357	1,001,034	1,684,177	1,656,261	991,748	722,292	375,325	356,154	419,331	413,404	136,337	38,631	28,219	74,124	0
2001	0	436,581	2,175,999	2,882,580	2,231,060	1,656,132	1,186,981	595,663	793,356	730,399	931,814	341,166	263,224	246,394	294,445	37,029
2002	0	961,445	3,469,719	3,195,542	2,429,415	1,436,828	1,503,347	1,424,991	1,359,789	1,604,479	1,128,069	1,266,188	289,693	601,019	799,130	189,162
2003	0	1,160,691	3,166,811	2,720,599	2,026,113	2,502,080	3,122,807	3,685,666	3,069,631	3,086,812	2,536,445	1,303,315	929,107	1,444,687	394,819	284,973
2004	197,201	1,349,421	2,916,416	3,520,598	3,778,608	4,373,201	5,858,298	4,425,560	4,533,173	3,016,751	2,341,641	2,112,114	1,879,021	446,825	632,897	0
2005	0	2,288,062	4,995,732	4,878,508	5,252,999	5,676,227	4,039,481	2,902,635	3,831,690	2,162,706	2,250,048	1,466,829	1,030,214	56,769	83,241	119,708
2006	167,017	4,749,132	7,170,972	8,792,086	7,283,499	5,322,231	5,600,418	4,671,021	3,540,666	2,615,465	1,802,317	1,668,972	778,891	185,668	168,606	0
2007	98,263	3,240,730	8,541,515	8,843,001	5,725,362	8,338,847	7,857,203	4,441,641	3,013,354	3,301,674	1,817,983	1,238,686	594,884	273,598	148,674	22,122
2008	180,714	5,053,501	17,127,472	17,888,687	21,776,693	30,183,601	16,965,676	11,133,809	9,444,156	6,863,486	2,021,045	2,138,144	1,168,571	240,556	128,478	149,635
2009	310,239	7,641,425	11,955,227	20,390,209	32,659,266	20,585,641	19,041,647	13,014,982	7,280,949	4,250,248	2,400,170	1,313,275	803,579	425,187	261,636	56,611
2010	0	2,258,486	9,667,062	16,733,653	13,117,747	12,867,799	11,390,106	6,594,915	3,864,557	1,852,033	1,128,674	1,097,113	494,110	602,902	220,142	14,440
2011	0	2,539,877	6,219,472	6,413,372	7,910,189	6,903,460	4,170,414	2,720,460	758,814	620,560	783,363	828,486	627,063	260,718	135,567	45,130
2012	61,140	1,515,694	3,340,360	4,668,440	4,873,554	3,676,288	2,258,445	1,411,620	741,571	1,165,685	566,139	683,332	507,508	317,475	337,111	24,836
2013	0	99,333	1,689,860	2,372,878	3,209,164	1,866,279	1,681,534	1,506,375	1,081,389	1,126,316	812,705	316,204	441,838	398,079	146,885	37,111
2014	0	345,717	830,534	2,042,565	2,088,830	844,892	503,373	805,840	982,694	760,392	459,236	341,179	231,127	169,723	131,252	13,750
2015	0	370,298	1,170,944	1,480,450	1,097,798	969,743	955,917	993,707	1,150,798	733,283	544,949	317,432	164,339	235,680	110,215	11,056
2016	0	97,395	1,267,871	1,194,090	1,065,760	1,226,858	1,672,658	1,457,016	997,634	951,771	587,518	288,789	367,132	132,588	126,863	26,353
2017	0	216,270	942,042	716,079	763,113	1,109,452	1,066,089	1,141,844	1,074,971	796,442	756,809	513,948	353,901	210,298	143,960	25,345
2018	0	251,501	618,234	844,750	1,349,003	1,806,991	1,577,759	921,137	753,584	347,920	583,405	243,844	412,097	35,981	16,251	16,710
2019	0	18,216	911,937	1,449,447	1,528,838	1,530,638	1,400,868	1,049,459	1,255,114	488,525	546,611	193,698	53,833	77,864	37,871	51,369
2020	0	226,144	898,713	1,189,353	1,049,855	1,553,620	760,009	593,940	743,611	451,763	216,803	230,478	218,971	87,503	0	38,625

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Conditional Loss Rate
FRM15

Table 12: Conditional Loss Severity = Table 11/Table 10
Loss Severity for Each Evaluation Year

	Evaluation Year															
Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1990	0.00%	62.52%	58.96%	64.50%	68.37%	77.06%	77.17%	60.48%	62.62%	53.09%	52.03%	43.65%	42.11%	39.97%	69.19%	92.53%
1991	34.42%	50.46%	55.46%	63.18%	75.03%	76.63%	62.65%	57.36%	54.68%	50.85%	38.77%	38.38%	15.32%	34.24%	-43.76%	-20.96%
1992	0.00%	46.00%	47.26%	66.81%	66.75%	57.72%	50.06%	44.88%	42.50%	46.91%	29.94%	27.67%	22.15%	95.28%	115.83%	0.00%
1993	0.00%	53.80%	62.50%	54.34%	45.48%	37.09%	44.29%	40.56%	35.23%	35.77%	25.84%	43.84%	3.33%	53.00%	83.31%	-1.44%
1994	29.41%	53.79%	55.99%	43.80%	37.65%	37.73%	37.97%	35.83%	38.56%	32.61%	38.20%	49.78%	70.58%	95.07%	51.31%	65.54%
1995	34.87%	29.15%	35.91%	37.48%	36.31%	35.01%	27.91%	36.76%	24.82%	34.10%	38.13%	61.55%	54.81%	107.32%	-15.09%	0.00%
1996	0.00%	43.01%	36.67%	35.04%	43.47%	32.81%	28.28%	31.58%	41.90%	51.64%	50.28%	63.00%	72.95%	34.07%	16.31%	104.65%
1997	0.00%	35.97%	34.31%	39.20%	42.11%	34.17%	42.28%	44.95%	25.75%	34.99%	47.94%	111.55%	58.70%	41.56%	16.26%	0.00%
1998	0.00%	37.15%	33.42%	32.69%	34.81%	34.16%	32.53%	40.34%	54.30%	46.13%	39.27%	50.54%	71.13%	0.00%	78.51%	0.00%
1999	0.00%	38.59%	29.22%	34.85%	32.69%	35.11%	41.61%	48.40%	57.90%	43.79%	56.68%	65.76%	48.20%	57.48%	45.69%	20.30%
2000	0.00%	34.36%	38.09%	32.90%	39.44%	50.29%	48.27%	45.61%	64.18%	56.48%	68.10%	73.71%	37.09%	20.59%	38.92%	0.00%
2001	0.00%	28.05%	36.54%	39.20%	39.59%	43.59%	52.81%	53.58%	47.95%	54.83%	71.17%	79.21%	43.26%	39.40%	50.36%	7.04%
2002	0.00%	42.37%	39.41%	40.21%	35.30%	42.09%	59.48%	61.30%	58.84%	57.20%	63.59%	54.79%	32.25%	36.37%	50.10%	66.38%
2003	0.00%	35.61%	42.20%	40.60%	44.90%	45.42%	55.43%	60.23%	55.68%	62.11%	43.70%	26.22%	33.78%	40.92%	31.40%	62.95%
2004	33.42%	39.04%	38.22%	46.45%	51.83%	58.02%	58.27%	60.09%	54.00%	48.02%	40.62%	52.62%	43.43%	38.56%	50.16%	0.00%
2005	0.00%	37.11%	43.18%	48.57%	49.79%	56.37%	56.83%	60.60%	54.83%	41.54%	51.79%	43.88%	53.42%	8.32%	35.80%	99.29%
2006	43.88%	46.85%	52.97%	56.52%	57.68%	65.02%	64.89%	54.75%	53.74%	52.41%	48.46%	64.24%	52.96%	34.67%	52.62%	0.00%
2007	44.15%	53.61%	60.34%	64.78%	68.44%	67.21%	56.60%	57.42%	56.08%	57.12%	47.57%	66.72%	47.45%	62.09%	54.61%	70.24%
2008	41.83%	48.12%	59.67%	64.43%	63.52%	58.63%	56.21%	56.16%	58.28%	58.73%	57.92%	56.65%	71.87%	63.08%	49.17%	49.84%
2009	50.97%	57.56%	63.33%	63.28%	53.00%	48.47%	51.38%	53.19%	56.74%	56.37%	52.53%	68.03%	55.40%	69.35%	50.27%	57.22%
2010	0.00%	54.52%	61.33%	52.81%	46.07%	47.57%	55.18%	55.06%	53.82%	51.45%	52.29%	54.61%	59.78%	63.77%	69.27%	48.21%
2011	0.00%	62.41%	50.24%	41.32%	46.58%	50.41%	50.97%	58.28%	22.42%	65.13%	53.10%	60.23%	66.45%	66.64%	50.09%	45.29%
2012	58.88%	47.02%	40.19%	43.40%	44.52%	45.57%	56.29%	48.85%	66.16%	54.48%	53.70%	69.00%	61.25%	65.06%	65.55%	41.68%
2013	0.00%	10.32%	48.03%	47.84%	56.32%	52.91%	55.05%	70.63%	47.40%	52.66%	63.33%	49.30%	63.82%	52.84%	50.26%	41.93%
2014	0.00%	39.94%	45.23%	43.90%	52.18%	49.60%	52.32%	57.72%	58.52%	51.15%	52.66%	48.31%	53.58%	51.02%	49.28%	100.00%
2015	0.00%	52.28%	57.53%	60.44%	51.25%	61.57%	48.79%	52.69%	58.50%	70.62%	51.55%	65.47%	64.30%	57.36%	55.43%	38.76%
2016	0.00%	29.88%	54.99%	52.80%	58.63%	61.88%	60.71%	61.75%	61.11%	60.27%	65.11%	63.88%	65.92%	70.14%	53.90%	100.00%
2017	0.00%	32.37%	42.66%	63.17%	47.04%	47.12%	50.04%	63.02%	67.88%	62.62%	63.76%	59.88%	58.48%	60.79%	61.69%	57.88%
2018	0.00%	41.62%	60.53%	51.08%	58.43%	60.12%	58.60%	56.68%	49.82%	52.56%	53.40%	70.31%	63.52%	57.73%	100.00%	55.61%
2019	0.00%	10.22%	51.70%	65.36%	58.18%	63.56%	64.62%	81.38%	63.72%	63.81%	68.58%	54.65%	54.86%	50.49%	64.61%	66.33%
2020	0.00%	31.91%	54.10%	70.82%	54.10%	60.18%	63.87%	62.33%	60.86%	57.82%	47.95%	59.13%	55.91%	54.56%	0.00%	63.07%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Cumulative Loss Rate
FRM15

Table 13: Cumulative Gross Claim Cost
Total Gross Losses for each Fiscal Year as of the End of the Evaluation Year

	Evaluation Year															
Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1990	0	2,168,528	10,932,242	25,780,344	40,867,375	57,817,160	68,727,575	74,783,129	78,959,771	81,917,736	84,533,048	85,333,840	85,624,442	86,034,735	86,173,812	86,194,543
1991	136,231	2,022,650	10,189,674	21,169,918	37,368,514	50,913,474	58,631,281	64,455,425	68,244,870	70,031,680	70,927,082	71,375,353	71,570,488	71,722,127	72,033,179	72,079,042
1992	0	1,343,200	6,168,973	12,364,051	20,358,287	25,299,079	30,055,572	32,985,792	34,344,599	35,421,980	35,846,709	35,963,310	36,084,425	36,148,677	36,199,805	36,199,805
1993	0	2,487,651	11,812,814	23,940,216	35,235,673	44,513,238	51,403,937	56,820,673	59,526,045	61,205,496	61,932,341	62,489,220	62,728,769	62,903,214	63,023,824	63,055,697
1994	325,955	5,500,534	20,671,410	39,899,902	60,025,679	74,442,376	84,644,599	89,739,902	93,629,501	95,573,940	96,707,657	97,351,650	97,793,842	97,981,371	98,060,709	98,084,091
1995	137,429	1,109,015	3,902,699	8,158,151	11,551,308	14,244,535	15,967,837	17,091,221	18,067,062	18,632,056	18,833,753	19,166,032	19,244,545	19,288,977	19,322,266	19,322,266
1996	0	1,041,300	5,049,898	10,870,490	16,170,015	20,529,876	23,805,721	25,716,649	27,269,391	28,115,922	28,722,128	29,104,306	29,141,863	29,204,721	29,286,768	29,312,830
1997	0	795,031	4,276,814	8,181,350	12,043,766	14,242,344	15,530,050	16,556,078	17,836,240	18,584,211	18,788,802	18,810,177	18,915,997	19,021,606	19,160,190	19,160,190
1998	0	506,108	5,094,547	9,217,701	15,242,983	18,636,231	21,175,068	22,992,594	23,894,638	24,441,448	24,668,586	25,106,889	25,689,341	25,703,906	25,989,368	26,025,226
1999	0	785,721	5,069,400	10,021,171	16,970,979	21,637,610	24,321,099	25,446,858	26,274,679	27,102,138	27,952,656	28,496,832	28,869,939	29,220,617	29,732,957	29,825,402
2000	0	417,225	3,045,123	8,164,088	12,363,700	14,335,658	15,831,937	16,654,893	17,209,799	17,952,227	18,559,250	18,744,203	18,848,367	18,985,427	19,175,864	19,291,995
2001	0	1,556,678	7,511,806	14,864,669	20,499,704	24,298,874	26,546,402	27,658,105	29,312,662	30,644,773	31,954,070	32,384,794	32,993,284	33,618,612	34,203,315	34,729,381
2002	3,460	2,272,434	11,076,338	19,023,038	25,905,444	29,319,404	31,846,882	34,171,571	36,482,523	39,287,397	41,061,430	43,372,505	44,270,765	45,923,373	47,518,527	47,803,511
2003	0	3,259,540	10,763,901	17,465,693	21,978,167	27,487,139	33,121,088	39,240,075	44,752,683	49,722,663	55,527,095	60,498,188	63,248,926	66,779,549	68,037,106	68,489,801
2004	590,005	4,046,586	11,677,494	19,256,947	26,546,743	34,084,575	44,139,023	51,504,448	59,899,398	66,181,284	71,945,951	75,959,518	80,285,588	81,444,374	82,706,040	82,720,904
2005	123,918	6,289,760	17,859,661	27,904,882	38,454,436	48,523,841	55,632,115	60,422,006	67,410,053	72,616,597	76,960,906	80,303,458	82,231,859	82,914,141	83,146,670	83,267,235
2006	380,605	10,518,044	24,055,995	39,610,956	52,237,362	60,422,645	69,053,662	77,584,645	84,172,968	89,163,619	92,882,817	95,480,867	96,951,448	97,486,975	97,807,370	97,807,370
2007	222,568	6,267,830	20,423,839	34,074,137	42,439,795	54,847,230	68,728,247	76,463,452	81,836,565	87,616,810	91,438,411	93,294,934	94,548,633	94,989,259	95,261,489	95,292,983
2008	431,991	10,934,146	39,638,725	67,401,797	101,685,484	153,164,871	183,348,473	203,174,824	219,378,743	231,064,273	234,553,522	238,327,870	239,953,719	240,335,087	240,596,368	240,896,602
2009	608,657	13,884,196	32,763,346	64,985,931	126,607,983	169,078,021	206,137,424	230,605,878	243,438,236	250,978,644	255,547,878	257,478,285	258,928,878	259,541,991	260,062,409	260,161,338
2010	15,278	4,157,837	19,920,801	51,606,537	80,077,646	107,127,200	127,770,277	139,747,816	146,927,686	150,527,602	152,686,198	154,695,348	155,521,942	156,467,446	156,785,253	156,815,204
2011	60,641	4,130,353	16,509,726	32,029,850	49,011,842	62,706,783	70,889,055	75,556,669	78,940,721	79,893,582	81,368,909	82,744,491	83,688,137	84,079,385	84,350,018	84,449,669
2012	103,845	3,327,169	11,638,927	22,395,154	33,341,788	41,409,531	45,421,983	48,311,445	49,432,277	51,572,097	52,626,453	53,616,740	54,445,308	54,933,308	55,447,599	55,507,190
2013	0	962,631	4,481,088	9,441,391	15,139,438	18,666,771	21,721,183	23,854,008	26,135,496	28,274,153	29,557,367	30,198,711	30,891,053	31,644,412	31,936,660	32,025,165
2014	0	865,559	2,701,695	7,354,295	11,357,409	13,060,689	14,022,783	15,418,897	17,098,277	18,584,780	19,456,791	20,163,071	20,594,451	20,927,117	21,193,430	21,207,180
2015	0	708,312	2,743,589	5,193,134	7,335,361	8,910,347	10,869,496	12,755,528	14,722,794	15,761,186	16,818,336	17,303,221	17,558,792	17,969,667	18,168,499	18,197,026
2016	107,263	433,165	2,738,838	5,000,234	6,817,998	8,800,787	11,555,965	13,915,685	15,548,302	17,127,458	18,029,758	18,481,852	19,038,800	19,227,824	19,463,183	19,489,536
2017	0	668,151	2,876,251	4,009,832	5,632,252	7,986,585	10,117,183	11,929,185	13,512,726	14,784,567	15,971,596	16,829,829	17,434,951	17,780,906	18,014,256	18,058,044
2018	0	604,302	1,625,693	3,279,460	5,588,064	8,593,809	11,286,032	12,911,174	14,423,711	15,085,596	16,178,112	16,524,949	17,173,682	17,236,007	17,252,258	17,282,307
2019	0	178,195	1,941,968	4,159,581	6,787,163	9,195,508	11,363,355	12,652,987	14,622,602	15,388,217	16,185,278	16,539,686	16,637,818	16,792,048	16,850,666	16,928,110
2020	0	708,607	2,369,705	4,049,159	5,989,621	8,571,030	9,761,023	10,713,922	11,935,768	12,717,102	13,169,240	13,559,026	13,950,646	14,111,026	14,111,026	14,172,271

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Cumulative Loss Rate
FRM15

Table 14: Cumulative Claim Cost Net of Recovery
Total Losses Net of Recovery for each Fiscal Year as of the End of the Evaluation Year

	Evaluation Year															
Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1990	0	1,355,718	6,522,680	16,100,321	26,414,668	39,475,573	47,895,200	51,557,383	54,172,724	55,743,214	57,103,982	57,453,550	57,575,913	57,739,904	57,836,126	57,855,309
1991	46,891	998,746	5,527,770	12,465,222	24,619,163	34,998,876	39,834,104	43,174,716	45,246,856	46,155,375	46,502,481	46,674,514	46,704,409	46,756,328	46,620,198	46,610,584
1992	0	617,859	2,898,610	7,037,490	12,374,008	15,225,804	17,607,013	18,921,953	19,499,381	20,004,831	20,131,989	20,164,253	20,191,079	20,252,301	20,311,522	20,311,522
1993	0	1,338,268	7,166,276	13,756,392	18,894,098	22,335,385	25,387,038	27,584,195	28,537,342	29,138,054	29,325,906	29,570,019	29,577,996	29,670,449	29,770,928	29,770,470
1994	95,848	2,879,276	11,373,706	19,795,617	27,373,393	32,812,791	36,686,569	38,512,395	40,012,167	40,646,182	41,079,241	41,399,804	41,711,897	41,890,179	41,930,883	41,946,207
1995	47,920	331,159	1,334,265	2,929,393	4,161,499	5,104,493	5,585,425	5,998,360	6,240,521	6,433,166	6,510,081	6,714,588	6,757,620	6,805,304	6,800,282	6,800,282
1996	0	447,824	1,917,872	3,957,690	6,261,428	7,691,939	8,618,243	9,221,650	9,872,251	10,309,432	10,614,263	10,855,040	10,882,438	10,903,850	10,917,234	10,944,508
1997	0	285,939	1,480,382	3,010,941	4,637,435	5,388,743	5,933,247	6,394,445	6,724,111	6,985,810	7,083,900	7,107,744	7,169,855	7,213,746	7,236,286	7,236,286
1998	0	188,031	1,721,627	3,069,477	5,166,683	6,325,951	7,151,961	7,885,122	8,374,901	8,627,121	8,716,317	8,937,846	9,352,153	9,352,153	9,576,263	9,576,263
1999	0	303,212	1,554,888	3,280,622	5,552,611	7,190,939	8,307,513	8,852,342	9,331,658	9,694,030	10,176,125	10,533,975	10,713,810	10,915,380	11,149,467	11,168,236
2000	0	143,357	1,144,391	2,828,568	4,484,828	5,476,576	6,198,869	6,574,193	6,930,347	7,349,679	7,763,083	7,899,420	7,938,051	7,966,269	8,040,394	8,040,394
2001	0	436,581	2,612,580	5,495,160	7,726,220	9,382,352	10,569,333	11,164,996	11,958,352	12,688,751	13,620,565	13,961,731	14,224,955	14,471,349	14,765,794	14,802,823
2002	0	961,445	4,431,164	7,626,706	10,056,121	11,492,948	12,996,295	14,421,286	15,781,075	17,385,554	18,513,623	19,779,810	20,069,503	20,670,523	21,469,652	21,658,814
2003	0	1,160,691	4,327,502	7,048,101	9,074,214	11,576,293	14,699,100	18,384,766	21,454,396	24,541,208	27,077,653	28,380,968	29,310,075	30,754,763	31,149,581	31,434,554
2004	197,201	1,546,623	4,463,039	7,983,637	11,762,245	16,135,447	21,993,744	26,419,305	30,952,477	33,969,229	36,310,870	38,422,984	40,302,005	40,748,830	41,381,727	41,381,727
2005	0	2,288,062	7,283,794	12,162,302	17,415,301	23,091,528	27,131,008	30,033,644	33,865,334	36,028,040	38,278,087	39,744,916	40,775,131	40,831,900	40,915,141	41,034,849
2006	167,017	4,916,149	12,087,120	20,879,206	28,162,705	33,484,936	39,085,354	43,756,375	47,297,041	49,912,506	51,714,822	53,383,794	54,162,685	54,348,353	54,516,958	54,516,958
2007	98,263	3,338,993	11,880,508	20,723,509	26,448,871	34,787,718	42,644,922	47,086,563	50,099,917	53,401,590	55,219,574	56,458,259	57,053,143	57,326,741	57,475,415	57,497,537
2008	180,714	5,234,215	22,361,687	40,250,374	62,027,067	92,210,667	109,176,343	120,310,152	129,754,307	136,617,793	138,638,838	140,776,982	141,945,552	142,186,108	142,314,586	142,464,221
2009	310,239	7,951,664	19,906,891	40,297,100	72,956,366	93,542,007	112,583,654	125,598,636	132,879,585	137,129,833	139,530,003	140,843,278	141,646,857	142,072,044	142,333,680	142,390,291
2010	0	2,258,486	11,925,548	28,659,201	41,776,948	54,644,747	66,034,852	72,629,768	76,494,324	78,346,358	79,475,031	80,572,144	81,066,254	81,669,157	81,889,299	81,903,739
2011	0	2,539,877	8,759,349	15,172,721	23,082,910	29,986,370	34,156,784	36,877,244	37,636,058	38,256,618	39,039,980	39,868,466	40,495,529	40,756,247	40,891,814	40,936,944
2012	61,140	1,576,834	4,917,194	9,585,634	14,459,187	18,135,475	20,393,920	21,805,540	22,547,111	23,712,796	24,278,935	24,962,268	25,469,776	25,787,251	26,124,362	26,149,198
2013	0	99,333	1,789,192	4,162,071	7,371,235	9,237,514	10,919,048	12,425,423	13,506,812	14,633,128	15,445,832	15,762,037	16,203,874	16,601,953	16,748,839	16,785,950
2014	0	345,717	1,176,251	3,218,815	5,307,646	6,152,537	6,655,910	7,461,750	8,444,444	9,204,836	9,664,072	10,005,251	10,236,378	10,406,101	10,537,353	10,551,102
2015	0	370,298	1,541,241	3,021,691	4,119,490	5,089,233	6,045,150	7,038,857	8,189,656	8,922,939	9,467,887	9,785,320	9,949,658	10,185,338	10,295,553	10,306,609
2016	0	97,395	1,365,266	2,559,356	3,625,116	4,851,974	6,524,631	7,981,647	8,979,281	9,931,052	10,518,569	10,807,358	11,174,490	11,307,077	11,433,940	11,460,293
2017	0	216,270	1,158,312	1,874,391	2,637,503	3,746,956	4,813,045	5,954,889	7,029,860	7,826,302	8,583,111	9,097,059	9,450,960	9,661,258	9,805,218	9,830,564
2018	0	251,501	869,736	1,714,485	3,063,488	4,870,479	6,448,238	7,369,375	8,122,959	8,470,878	9,054,284	9,298,128	9,710,225	9,746,205	9,762,457	9,779,167
2019	0	18,216	930,153	2,379,600	3,908,438	5,439,075	6,839,944	7,889,403	9,144,517	9,633,042	10,179,653	10,373,351	10,427,184	10,505,048	10,542,919	10,594,288
2020	0	226,144	1,124,856	2,314,209	3,364,064	4,917,683	5,677,693	6,271,633	7,015,244	7,467,007	7,683,810	7,914,288	8,133,259	8,220,762	8,220,762	8,259,387

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Cumulative Loss Rate
FRM15

Table 15: Cumulative Loss Severity = Table 14/Table 13
Loss Severity for Each Evaluation Year

	Evaluation Year															
Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1990	0.00%	62.52%	59.66%	62.45%	64.64%	68.28%	69.69%	68.94%	68.61%	68.05%	67.55%	67.33%	67.24%	67.11%	67.12%	67.12%
1991	34.42%	49.38%	54.25%	58.88%	65.88%	68.74%	67.94%	66.98%	66.30%	65.91%	65.56%	65.39%	65.26%	65.19%	64.72%	64.67%
1992	0.00%	46.00%	46.99%	56.92%	60.78%	60.18%	58.58%	57.36%	56.78%	56.48%	56.16%	56.07%	55.96%	56.03%	56.11%	56.11%
1993	0.00%	53.80%	60.67%	57.46%	53.62%	50.18%	49.39%	48.55%	47.94%	47.61%	47.35%	47.32%	47.15%	47.17%	47.24%	47.21%
1994	29.41%	52.35%	55.02%	49.61%	45.60%	44.08%	43.34%	42.92%	42.73%	42.53%	42.48%	42.53%	42.65%	42.75%	42.76%	42.77%
1995	34.87%	29.86%	34.19%	35.91%	36.03%	35.83%	34.98%	35.10%	34.54%	34.53%	34.57%	35.03%	35.11%	35.28%	35.19%	35.19%
1996	0.00%	43.01%	37.98%	36.41%	38.72%	37.47%	36.20%	35.86%	36.20%	36.67%	36.96%	37.30%	37.34%	37.34%	37.28%	37.34%
1997	0.00%	35.97%	34.61%	36.80%	38.50%	37.84%	38.20%	38.62%	37.70%	37.59%	37.70%	37.79%	37.90%	37.92%	37.77%	37.77%
1998	0.00%	37.15%	33.79%	33.30%	33.90%	33.94%	33.78%	34.29%	35.05%	35.30%	35.33%	35.60%	36.40%	36.38%	36.85%	36.80%
1999	0.00%	38.59%	30.67%	32.74%	32.72%	33.23%	34.16%	34.79%	35.52%	35.77%	36.40%	36.97%	37.11%	37.36%	37.50%	37.45%
2000	0.00%	34.36%	37.58%	34.65%	36.27%	38.20%	39.15%	39.47%	40.27%	40.94%	41.83%	42.14%	42.12%	41.96%	41.93%	41.68%
2001	0.00%	28.05%	34.78%	36.97%	37.69%	38.61%	39.81%	40.37%	40.80%	41.41%	42.63%	43.11%	43.11%	43.05%	43.17%	42.62%
2002	0.00%	42.31%	40.01%	40.09%	38.82%	39.20%	40.81%	42.20%	43.26%	44.25%	45.09%	45.60%	45.33%	45.01%	45.18%	45.31%
2003	0.00%	35.61%	40.20%	40.35%	41.29%	42.12%	44.38%	46.85%	47.94%	49.36%	48.76%	46.91%	46.34%	46.05%	45.78%	45.90%
2004	33.42%	38.22%	38.22%	41.46%	44.31%	47.34%	49.83%	51.30%	51.67%	51.33%	50.47%	50.58%	50.20%	50.03%	50.03%	50.03%
2005	0.00%	36.38%	40.78%	43.58%	45.29%	47.59%	48.77%	49.71%	50.24%	49.61%	49.74%	49.49%	49.59%	49.25%	49.21%	49.28%
2006	43.88%	46.74%	50.25%	52.71%	53.91%	55.42%	56.60%	56.40%	56.19%	55.98%	55.68%	55.91%	55.87%	55.75%	55.74%	55.74%
2007	44.15%	53.27%	58.17%	60.82%	62.32%	63.43%	62.05%	61.58%	61.22%	60.95%	60.39%	60.52%	60.34%	60.35%	60.33%	60.34%
2008	41.83%	47.87%	56.41%	59.72%	61.00%	60.20%	59.55%	59.22%	59.15%	59.13%	59.11%	59.07%	59.16%	59.16%	59.15%	59.14%
2009	50.97%	57.27%	60.76%	62.01%	57.62%	55.32%	54.62%	54.46%	54.58%	54.64%	54.60%	54.70%	54.70%	54.74%	54.73%	54.73%
2010	0.00%	54.32%	59.86%	55.53%	52.17%	51.01%	51.68%	51.97%	52.06%	52.05%	52.05%	52.08%	52.13%	52.20%	52.23%	52.23%
2011	0.00%	61.49%	53.06%	47.37%	47.10%	47.82%	48.18%	48.81%	47.68%	47.88%	47.98%	48.18%	48.39%	48.47%	48.48%	48.47%
2012	58.88%	47.39%	42.25%	42.80%	43.37%	43.80%	44.90%	45.14%	45.61%	45.98%	46.13%	46.56%	46.78%	46.94%	47.12%	47.11%
2013	0.00%	10.32%	39.93%	44.08%	48.69%	49.49%	50.27%	52.09%	51.68%	51.75%	52.26%	52.19%	52.45%	52.46%	52.44%	52.41%
2014	0.00%	39.94%	43.54%	43.77%	46.73%	47.11%	47.46%	48.39%	49.39%	49.53%	49.67%	49.62%	49.70%	49.73%	49.72%	49.75%
2015	0.00%	52.28%	56.18%	58.19%	56.16%	57.12%	55.62%	55.18%	55.63%	56.61%	56.30%	56.55%	56.66%	56.68%	56.67%	56.64%
2016	0.00%	22.48%	49.85%	51.18%	53.17%	55.13%	56.46%	57.36%	57.75%	57.98%	58.34%	58.48%	58.69%	58.81%	58.75%	58.80%
2017	0.00%	32.37%	40.27%	46.74%	46.83%	46.92%	47.57%	49.92%	52.02%	52.94%	53.74%	54.05%	54.21%	54.34%	54.43%	54.44%
2018	0.00%	41.62%	53.50%	52.28%	54.82%	56.67%	57.13%	57.08%	56.32%	56.15%	55.97%	56.27%	56.54%	56.55%	56.59%	56.58%
2019	0.00%	10.22%	47.90%	57.21%	57.59%	59.15%	60.19%	62.35%	62.54%	62.60%	62.89%	62.72%	62.67%	62.56%	62.57%	62.58%
2020	0.00%	31.91%	47.47%	57.15%	56.16%	57.38%	58.17%	58.54%	58.77%	58.72%	58.35%	58.37%	58.30%	58.26%	58.26%	58.28%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Active Loans
FRM30

Table 1: Number of Loans Active at the End of Each Evaluation Year

	Evaluation Year																														
Fiscal Year	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	31	32
1990	682,780	667,129	592,851	403,464	272,944	242,290	205,676	179,522	145,455	114,018	99,913	85,515	68,443	52,593	42,309	35,918	29,059	26,453	24,593	22,882	21,364	20,037	18,991	17,907	16,734	15,472	14,418	13,357	11,899	9,365	679	
1991	561,627	532,580	397,490	274,018	246,277	209,914	183,444	146,417	113,104	99,037	83,648	65,365	48,139	37,573	31,342	25,618	23,129	21,403	19,883	18,775	17,370	16,388	15,451	14,531	13,576	12,558	11,669	10,702	9,547	7,546	0	
1992	477,039	432,472	355,657	328,977	289,998	258,483	208,352	159,247	140,274	117,009	87,924	58,420	43,259	34,827	29,257	25,880	23,576	21,782	20,315	18,961	17,524	16,289	15,150	14,063	12,902	11,674	10,584	9,450	8,135	7,151	656	
1993	721,496	670,805	636,257	581,044	528,760	449,625	362,759	321,636	270,632	204,288	123,475	87,582	68,445	56,734	49,879	45,089	41,355	38,094	35,277	32,629	29,264	26,976	24,730	22,620	20,470	18,210	16,356	14,454	13,262	11,535	1,232	
1994	771,624	746,562	688,620	632,923	545,024	450,008	401,808	341,843	265,719	167,296	120,169	93,954	78,509	69,061	62,616	57,630	53,302	49,429	45,737	41,493	37,336	34,462	31,505	28,723	25,897	23,010	20,663	19,080	17,597	14,314	779	
1995	358,166	330,642	305,701	252,618	200,318	177,021	147,198	111,820	73,442	52,618	40,383	33,042	28,480	25,740	23,910	22,322	20,936	19,629	18,251	17,072	15,756	14,574	13,431	12,441	11,461	10,489	9,681	8,854	7,938	6,771	836	
1996	541,019	523,632	453,188	367,745	328,772	274,129	206,840	131,567	92,662	70,143	56,966	49,059	44,198	40,818	38,057	35,664	33,370	30,869	28,782	26,723	24,529	22,661	20,969	19,398	17,910	16,384	15,084	13,595	12,204	10,538	1,163	
1997	488,347	442,318	366,662	331,635	277,585	209,191	133,447	93,918	70,806	57,507	49,637	44,608	41,247	38,537	36,211	33,942	31,430	29,385	27,334	25,278	23,132	21,407	19,880	18,512	17,080	15,659	14,184	12,878	11,707	10,361	1,423	
1998	853,375	793,460	739,448	638,600	494,087	296,329	200,448	146,861	117,799	100,656	90,037	82,027	75,819	70,599	65,639	59,796	55,363	51,075	46,817	42,848	39,170	36,325	33,631	30,791	28,150	25,180	22,709	20,620	18,756	16,754	2,791	
1999	1,017,298	983,099	849,651	651,620	396,398	268,763	195,449	156,222	133,301	118,898	108,152	99,807	92,552	85,747	77,644	71,791	66,066	60,493	55,385	50,934	46,881	43,458	40,057	36,927	33,483	30,063	27,443	25,275	23,166	20,312	1,986	
2000	725,074	547,800	358,877	211,975	140,481	100,335	78,651	66,219	58,666	53,399	49,260	45,949	42,828	39,325	36,522	33,779	31,067	28,739	26,650	24,944	23,249	21,715	20,226	18,569	16,975	15,602	14,437	13,335	12,252	10,658	1,458	
2001	984,294	811,301	458,898	300,244	212,975	167,173	141,081	124,493	111,068	101,122	93,121	85,554	76,448	70,131	64,330	58,721	53,703	49,605	46,199	43,100	39,632	36,763	33,922	31,230	28,886	26,800	24,848	23,004	21,268	19,243	3,266	
2002	952,225	636,870	442,121	321,260	257,613	219,673	194,985	172,525	155,960	142,635	129,516	113,078	102,599	93,355	84,745	76,951	70,683	65,391	60,787	56,647	52,154	48,338	45,003	42,273	39,838	37,246	34,911	32,668	30,354	27,118	4,519	
2003	785,190	650,033	501,249	413,667	359,232	324,377	292,042	265,516	242,685	216,948	182,320	163,068	146,212	130,819	117,229	106,630	98,002	89,761	84,306	80,074	73,557	69,882	66,714	63,859	61,020	56,827	54,068	51,313	48,424	44,875	70	
2004	708,233	580,088	489,077	427,990	388,017	349,779	318,307	291,842	261,146	218,689	195,104	174,695	156,415	140,521	128,162	118,169	108,673	102,102	96,946	91,246	83,965	80,242	76,941	73,730	70,116	65,217	61,975	58,785	55,632	42,738	156	
2005	394,786	357,801	320,538	292,879	265,011	241,152	220,832	196,403	162,084	143,395	127,340	113,076	101,069	92,163	84,924	78,044	74,086	71,270	68,489	65,721	61,468	59,568	57,774	55,892	53,849	50,502	48,562	46,560	44,456	39,189	151	
2006	373,202	345,416	310,476	266,877	235,697	211,818	184,154	147,382	127,387	110,793	96,901	85,629	77,309	70,984	65,416	61,488	58,723	56,076	53,632	51,499	49,067	47,426	45,753	44,002	42,180	39,943	38,182	36,326	34,587	29,082	168	
2007	384,366	343,440	285,607	249,511	224,159	194,354	153,017	129,544	111,560	96,484	84,081	75,431	68,933	63,397	59,403	56,171	53,292	50,749	48,702	46,874	44,818	43,099	41,437	39,741	37,943	36,022	34,299	32,573	30,879	27,402	173	
2008	973,082	785,272	677,273	604,370	511,884	384,222	317,467	269,865	230,311	198,657	176,791	160,351	146,229	136,193	128,493	121,657	115,894	111,549	107,640	103,888	99,569	95,964	92,180	88,480	84,619	80,410	76,447	72,576	68,910	62,695	536	
2009	1,656,674	1,520,793	1,400,116	1,190,545	911,207	782,385	654,058	541,322	455,158	399,040	357,623	315,482	290,724	273,547	259,747	248,854	240,349	233,104	226,416	219,583	211,311	204,289	197,353	190,544	183,438	175,254	168,079	160,857	153,786	141,230	880	
2010	1,512,407	1,449,768	1,318,768	1,110,277	989,150	824,438	680,254	569,303	495,984	441,771	381,489	345,186	321,607	303,515	289,804	279,357	270,535	262,818	255,384	247,615	238,780	231,071	223,369	215,493	207,286	198,110	189,945	181,998	173,994	155,684	1,091	
2011	1,052,639	982,363	847,560	759,279	637,135	529,702	445,882	390,058	347,920	300,087	273,456	256,603	243,263	233,135	225,331	219,010	213,370	208,243	203,218	197,782	191,654	186,553	181,033	175,545	169,823	163,307	157,495	151,904	146,189	128,669	913	
2012	1,054,971	973,485	889,180	758,404	642,987	547,441	480,740	430,048	374,320	349,741	333,239	319,499	308,771	300,488	293,436	287,217	281,558	276,337	271,198	265,876	259,634	254,233	248,667	242,902	237,031	229,395	223,166	216,881	210,536	197,022	1,027	
2013	1,257,119	1,196,326	1,052,302	915,294	795,004	702,326	629,836	551,466	524,800	506,844	490,695	477,390	466,680	457,728	449,611	442,188	435,139	428,560	422,065	415,349	402,748	395,765	388,455	380,826	372,816	358,735	349,796	341,627	333,867	305,503	1,182	
2014	726,002	568,477	470,099	394,440	341,161	299,238	254,276	233,930	220,997	209,907	200,774	193,835	188,135	183,312	178,926	174,965	171,368	167,983	164,750	161,205	156,111	152,729	149,153	145,210	140,938	134,444	130,637	126,884	123,167	111,820	1,014	
2015	1,040,404	897,499	764,680	662,409	576,952	470,720	430,726	404,797	383,674	367,016	353,326	342,062	331,954	323,114	315,092	307,778	301,367	295,411	289,481	283,248	275,055	269,021	262,550	255,633	248,581	238,651	231,912	224,939	217,950	203,095	1,804	
2016	1,187,135	1,071,400	958,459	843,863	687,264	624,410	582,067	547,148	519,715	497,713	478,744	461,973	447,337	434,253	422,363	411,764	402,246	393,713	385,323	376,755	364,437	355,638	346,418	335,256	325,100	311,565	301,569	291,462	280,712	254,465	2,468	
2017	1,188,507	1,091,241	973,406	777,195	706,958	655,542	609,931	574,064	546,091	522,793	501,032	481,382	464,207	448,790	435,473	423,576	412,907	403,004	393,457	383,323	369,370	359,349	348,335	336,411	325,347	311,551	300,245	288,342	274,629	241,654	2,024	
2018	975,983	859,090	663,467	586,929	529,882	480,108	440,231	409,985	385,856	365,028	346,372	329,672	315,333	302,972	292,225	282,716	274,213	266,411	258,850	251,144	241,324	233,488	225,577	217,622	209,604	200,341	192,073	183,772	175,494	155,972	909	
2019	930,408	699,117	612,626	548,469	494,206	448,485	412,973	384,701	360,966	340,391	321,535	304,636	290,518	278,395	267,735	258,230	249,889	242,324	234,949	227,602	218,911	211,529	204,194	196,771	189,127	180,812	173,038	165,303	157,580	144,536	1,836	
2020	1,240,341	1,174,505	1,111,335	1,049,360	992,366	941,957	898,292	859,186	825,365	794,699	766,060	741,005	719,098	699,576	681,954	665,894	651,110	637,598	624,422	610,701	593,868	580,259	566,150	551,308	535,696	514,723	496,374	474,420	451,061	405,993	0	

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Conditional Claim Rate
FRM30

Table 2: Number of Claims in Each Evaluation Year

	Evaluation Year																													
Fiscal Year	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	55	1,926	7,444	10,410	9,606	7,048	5,010	4,333	3,277	2,371	1,666	998	727	594	434	292	215	167	157	126	144	141	100	114	69	62	80	52	43	33
1991	40	1,537	5,804	7,227	6,189	4,716	4,215	3,329	2,383	1,733	1,010	737	535	414	287	194	124	136	111	122	134	111	111	71	81	97	52	40	38	16
1992	20	961	3,263	4,179	3,999	4,055	3,520	2,774	1,893	1,205	854	587	439	264	192	131	134	105	104	128	102	106	69	87	85	67	46	28	11	8
1993	36	1,210	4,081	5,720	7,081	6,536	5,186	3,576	2,097	1,497	1,112	779	482	307	211	185	186	218	228	170	216	153	190	199	146	81	57	26	26	29
1994	54	1,735	5,141	7,804	8,489	7,231	5,033	3,132	2,314	1,702	1,169	764	465	348	269	284	382	302	272	342	264	232	259	167	126	78	37	35	45	62
1995	25	845	3,594	5,883	5,668	4,335	2,870	2,012	1,821	1,253	748	467	354	281	284	305	274	217	230	173	197	213	146	109	75	29	25	35	33	30
1996	19	1,443	6,307	8,914	7,554	5,402	3,960	3,509	2,389	1,472	915	627	523	487	579	469	449	433	327	375	403	282	205	138	63	55	47	58	67	49
1997	28	1,462	5,617	7,046	5,597	4,855	4,228	2,984	1,919	1,182	796	684	575	647	566	483	549	414	420	457	338	235	166	85	67	76	79	55	68	61
1998	28	2,028	7,808	8,795	8,452	8,295	5,684	3,689	2,287	1,582	1,294	1,208	1,342	1,174	1,074	1,138	889	897	927	587	391	249	136	92	135	133	120	108	91	81
1999	43	2,826	9,300	12,747	14,362	10,295	6,440	3,809	2,538	2,096	1,886	2,020	1,920	1,646	1,747	1,282	1,258	1,282	833	634	374	199	157	171	216	174	157	137	104	84
2000	53	2,713	10,788	15,127	10,997	6,411	3,698	2,494	2,028	1,631	1,714	1,424	1,199	1,248	933	932	911	640	499	290	170	99	134	131	132	114	96	77	58	59
2001	18	3,422	14,373	16,147	11,228	6,895	4,567	3,730	3,119	3,417	3,002	2,547	2,581	1,863	1,814	1,669	1,152	723	494	254	171	203	208	173	150	141	115	111	81	69
2002	44	3,889	13,181	12,847	8,817	6,206	4,974	4,508	4,908	4,204	3,844	3,996	2,811	2,608	2,454	1,594	1,045	751	311	233	259	245	201	166	142	111	124	110	116	80
2003	40	4,445	9,794	8,584	6,796	6,289	6,121	7,370	6,247	6,239	6,752	4,832	3,868	3,345	2,090	1,320	819	367	332	320	304	285	198	199	164	163	149	137	135	101
2004	562	5,894	8,975	9,171	9,292	9,038	10,400	8,582	8,868	9,461	6,751	5,592	4,753	2,969	1,851	1,186	558	500	457	412	409	294	257	218	215	204	179	167	138	136
2005	202	2,663	6,423	7,818	8,650	9,609	8,119	8,156	8,698	6,240	5,099	4,316	2,800	1,696	1,123	474	424	370	307	307	201	187	159	149	151	134	123	124	114	79
2006	98	2,689	7,781	10,812	12,667	9,974	9,835	10,757	7,468	5,998	5,009	3,218	2,165	1,338	663	476	410	356	347	247	208	176	141	137	141	109	101	109	82	87
2007	102	3,506	10,957	15,209	11,423	12,623	16,039	10,224	7,604	6,486	4,342	2,696	1,826	944	563	595	491	446	330	256	212	199	163	179	152	154	117	133	109	85
2008	174	7,525	25,967	25,690	30,902	42,434	27,095	19,157	16,027	10,374	6,388	4,413	2,296	1,296	1,297	1,145	1,011	708	604	521	426	339	344	296	292	286	265	237	207	205
2009	291	8,999	20,239	30,207	46,518	34,766	25,576	21,212	14,214	9,064	5,958	3,125	1,797	1,794	1,572	1,453	969	829	622	563	443	386	317	267	279	265	265	239	211	172
2010	145	3,317	10,430	20,057	19,442	17,003	13,961	10,021	6,801	4,736	2,236	1,652	1,668	1,305	1,082	811	718	604	472	382	348	295	293	245	258	240	204	181	190	159
2011	107	2,085	6,322	7,472	7,427	6,848	5,481	3,706	2,599	1,264	1,102	1,172	958	778	639	476	413	352	281	260	216	185	175	146	181	131	133	135	117	110
2012	75	1,515	3,625	4,857	5,644	4,733	3,502	2,622	1,230	1,274	1,155	955	778	613	598	500	409	333	333	265	233	198	205	160	171	153	166	154	133	109
2013	94	1,447	3,721	5,453	5,688	4,524	3,445	1,766	1,942	2,128	1,786	1,620	1,338	1,267	1,192	1,085	901	805	677	623	529	408	394	392	351	331	299	266	295	234
2014	18	769	2,506	3,835	3,378	2,858	1,524	1,351	1,362	1,256	953	712	650	524	412	389	351	289	256	195	205	144	132	142	145	116	87	109	97	83
2015	18	707	3,019	4,035	4,131	2,501	2,304	2,624	2,139	1,689	1,101	857	751	637	550	478	416	341	330	255	229	203	151	155	158	146	108	125	113	104
2016	17	896	3,193	4,631	3,320	3,876	3,915	3,436	2,812	1,933	1,546	1,287	1,055	950	824	698	602	489	407	368	256	249	232	208	219	196	185	168	165	159
2017	25	923	3,548	3,655	5,625	7,525	6,698	5,156	3,613	2,791	2,150	1,805	1,539	1,168	1,081	864	715	625	549	493	381	350	308	307	281	304	265	202	224	186
2018	24	1,070	2,545	5,158	7,707	7,703	6,829	5,375	3,990	3,314	2,448	2,003	1,612	1,308	1,071	911	780	640	568	535	426	373	331	326	323	293	274	297	236	205
2019	30	497	3,986	6,583	7,341	6,955	5,518	4,108	3,316	2,783	2,226	1,817	1,416	1,131	1,000	841	714	621	541	446	430	342	300	302	249	238	226	217	223	204
2020	5	2,151	5,072	6,927	7,932	7,144	6,249	5,568	4,551	3,918	3,425	2,901	2,527	2,195	1,969	1,782	1,580	1,365	1,154	1,024	832	724	650	621	571	483	492	459	374	346

Table 3: Conditional Claim Rate = Table 2 / Table 1
Percentage of Active Loans at the Beginnng of the Evaluation Year that end in Claim During the Evaluation Year

	Evaluation Year																													
Fiscal Year	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	0.01%	0.29%	1.26%	2.58%	3.52%	2.91%	2.44%	2.41%	2.25%	2.08%	1.67%	1.17%	1.06%	1.13%	1.03%	0.81%	0.74%	0.63%	0.64%	0.55%	0.67%	0.70%	0.53%	0.64%	0.41%	0.40%	0.55%	0.39%	0.36%	0.35%
1991	0.01%	0.29%	1.46%	2.64%	2.51%	2.25%	2.30%	2.27%	2.11%	1.75%	1.21%	1.13%	1.11%	1.10%	0.92%	0.76%	0.54%	0.64%	0.56%	0.65%	0.77%	0.68%	0.72%	0.49%	0.60%	0.77%	0.45%	0.37%	0.40%	0.21%
1992	0.00%	0.22%	0.92%	1.27%	1.38%	1.57%	1.69%	1.74%	1.35%	1.03%	0.97%	1.00%	1.01%	0.76%	0.66%	0.51%	0.57%	0.48%	0.51%	0.68%	0.58%	0.65%	0.46%	0.62%	0.66%	0.57%	0.43%	0.30%	0.14%	0.11%
1993	0.00%	0.18%	0.64%	0.98%	1.34%	1.45%	1.43%	1.11%	0.77%	0.73%	0.90%	0.89%	0.70%	0.54%	0.42%	0.41%	0.45%	0.57%	0.65%	0.52%	0.74%	0.57%	0.77%	0.88%	0.71%	0.44%	0.35%	0.18%	0.20%	0.25%
1994	0.01%	0.23%	0.75%	1.23%	1.56%	1.61%	1.25%	0.92%	0.87%	1.02%	0.97%	0.81%	0.59%	0.50%	0.43%	0.49%	0.72%	0.61%	0.59%	0.82%	0.71%	0.67%	0.82%	0.58%	0.49%	0.34%	0.18%	0.18%	0.26%	0.43%
1995	0.01%	0.26%	1.18%	2.33%	2.83%	2.45%	1.95%	1.80%	2.48%	2.38%	1.85%	1.41%	1.24%	1.09%	1.19%	1.37%	1.31%	1.11%	1.26%	1.01%	1.25%	1.46%	1.09%	0.88%	0.65%	0.28%	0.26%	0.40%	0.42%	0.44%
1996	0.00%	0.28%	1.39%	2.42%	2.30%	1.97%	1.91%	2.67%	2.58%	2.10%	1.61%	1.28%	1.18%	1.19%	1.52%	1.32%	1.35%	1.40%	1.14%	1.40%	1.64%	1.24%	0.98%	0.71%	0.35%	0.34%	0.31%	0.43%	0.55%	0.46%
1997	0.01%	0.33%	1.53%	2.12%	2.02%	2.32%	3.17%	3.18%	2.71%	2.06%	1.60%	1.53%	1.39%	1.68%	1.56%	1.42%	1.75%	1.41%	1.54%	1.81%	1.46%	1.10%	0.84%	0.46%	0.39%	0.49%	0.56%	0.43%	0.58%	0.59%
1998	0.00%	0.26%	1.06%	1.38%	1.71%	2.80%	2.84%	2.51%	1.94%	1.57%	1.44%	1.47%	1.77%	1.66%	1.64%	1.90%	1.61%	1.76%	1.98%	1.37%	1.00%	0.69%	0.40%	0.30%	0.48%	0.53%	0.53%	0.52%	0.49%	0.48%
1999	0.00%	0.29%	1.09%	1.96%	3.62%	3.83%	3.29%	2.44%	1.90%	1.76%	1.74%	2.02%	2.07%	1.92%	2.25%	1.79%	1.90%	2.12%	1.50%	1.24%	0.80%	0.46%	0.39%	0.46%	0.65%	0.58%	0.57%	0.54%	0.45%	0.41%
2000	0.01%	0.50%	3.01%	7.14%	7.83%	6.39%	4.70%	3.77%	3.46%	3.05%	3.48%	3.10%	2.80%	3.17%	2.55%	2.76%	2.93%	2.23%	1.87%	1.16%	0.73%	0.46%	0.66%	0.71%	0.78%	0.73%	0.66%	0.58%	0.47%	0.55%
2001	0.00%	0.42%	3.13%	5.38%	5.27%	4.12%	3.24%	3.00%	2.81%	3.38%	3.22%	2.98%	3.38%	2.66%	2.82%	2.84%	2.15%	1.46%	1.07%	0.59%	0.43%	0.55%	0.61%	0.55%	0.52%	0.53%	0.46%	0.48%	0.38%	0.36%
2002	0.00%	0.61%	2.98%	4.00%	3.42%	2.83%	2.55%	2.61%	3.15%	2.95%	2.97%	3.53%	2.74%	2.79%	2.90%	2.07%	1.48%	1.15%	0.51%	0.41%	0.50%	0.51%	0.45%	0.39%	0.36%	0.30%	0.36%	0.34%	0.38%	0.30%
2003	0.01%	0.68%	1.95%	2.08%	1.89%	1.94%	2.10%	2.78%	2.57%	2.88%	3.70%	2.96%	2.65%	2.56%	1.78%	1.24%	0.84%	0.41%	0.39%	0.40%	0.41%	0.41%	0.30%	0.31%	0.27%	0.29%	0.28%	0.27%	0.28%	0.23%
2004	0.08%	1.02%	1.84%	2.14%	2.39%	2.58%	3.27%	2.94%	3.40%	4.33%	3.46%	3.20%	3.04%	2.11%	1.44%	1.00%	0.51%	0.49%	0.47%	0.45%	0.49%	0.37%	0.33%	0.30%	0.31%	0.31%	0.29%	0.28%	0.25%	0.32%
2005	0.05%	0.74%	2.00%	2.67%	3.26%	3.98%	3.68%	4.15%	5.37%	4.35%	4.00%	3.82%	2.77%	1.84%	1.32%	0.61%	0.57%	0.52%	0.45%	0.47%	0.33%	0.31%	0.28%	0.27%	0.28%	0.27%	0.25%	0.27%	0.26%	0.20%
2006	0.03%	0.78%	2.51%	4.05%	5.37%	4.71%	5.34%	7.30%	5.86%	5.41%	5.17%	3.76%	2.80%	1.88%	1.01%	0.77%	0.70%	0.63%	0.65%	0.48%	0.42%	0.37%	0.31%	0.31%	0.33%	0.27%	0.26%	0.30%	0.24%	0.30%
2007	0.03%	1.02%	3.84%	6.10%	5.10%	6.49%	10.48%	7.89%	6.82%	6.72%	5.16%	3.57%	2.65%	1.49%	0.95%	1.06%	0.92%	0.88%	0.68%	0.55%	0.47%	0.46%	0.39%	0.45%	0.40%	0.43%	0.34%	0.41%	0.35%	0.31%
2008	0.02%	0.96%	3.83%	4.25%	6.04%	11.04%	8.53%	7.10%	6.96%	5.22%	3.61%	2.75%	1.57%	0.95%	1.01%	0.94%	0.87%	0.63%	0.56%	0.50%	0.43%	0.35%	0.37%	0.33%	0.35%	0.36%	0.35%	0.33%	0.30%	0.33%
2009	0.02%	0.59%	1.45%	2.54%	5.11%	4.44%	3.91%	3.92%	3.12%	2.27%	1.67%	0.99%	0.62%	0.66%	0.61%	0.58%	0.40%	0.36%	0.27%	0.26%	0.21%	0.19%	0.16%	0.14%	0.15%	0.15%	0.16%	0.15%	0.14%	0.12%
2010	0.01%	0.23%	0.79%	1.81%	1.97%	2.06%	2.05%	1.76%	1.37%	1.07%	0.59%	0.48%	0.52%	0.43%	0.37%	0.29%	0.27%	0.23%	0.18%	0.15%	0.15%	0.13%	0.13%	0.11%	0.12%	0.12%	0.11%	0.10%	0.11%	0.10%
2011	0.01%	0.21%	0.75%	0.98%	1.17%	1.29%	1.23%	0.95%	0.75%	0.42%	0.40%	0.46%	0.39%	0.33%	0.28%	0.22%	0.19%	0.17%	0.14%	0.13%	0.11%	0.10%	0.10%	0.08%	0.11%	0.08%	0.08%	0.09%	0.08%	0.09%
2012	0.01%	0.16%	0.41%	0.64%	0.88%	0.86%	0.73%	0.61%	0.33%	0.36%	0.35%	0.30%	0.25%	0.20%	0.20%	0.17%	0.15%	0.12%	0.12%	0.10%	0.09%	0.08%	0.08%	0.07%	0.07%	0.07%	0.07%	0.07%	0.06%	0.06%
2013	0.01%	0.12%	0.35%	0.60%	0.72%	0.64%	0.55%	0.32%	0.37%	0.42%	0.36%	0.34%	0.29%	0.28%	0.27%	0.25%	0.21%	0.19%	0.16%	0.15%	0.13%	0.10%	0.10%	0.10%	0.09%	0.09%	0.09%	0.08%	0.09%	0.08%
2014	0.00%	0.14%	0.53%	0.97%	0.99%	0.96%	0.60%	0.58%	0.62%	0.60%	0.47%	0.37%	0.35%	0.29%	0.23%	0.22%	0.20%	0.17%	0.16%	0.12%	0.13%	0.09%	0.09%	0.10%	0.10%	0.09%	0.07%	0.09%	0.08%	0.07%
2015	0.00%	0.08%	0.39%	0.61%	0.72%	0.53%	0.53%	0.65%	0.56%	0.46%	0.31%	0.25%	0.23%	0.20%	0.17%	0.16%	0.14%	0.12%	0.11%	0.09%	0.08%	0.08%	0.06%	0.06%	0.06%	0.06%	0.05%	0.06%	0.05%	0.05%
2016	0.00%	0.08%	0.33%	0.55%	0.48%	0.62%	0.67%	0.63%	0.54%	0.39%	0.32%	0.28%	0.24%	0.22%	0.20%	0.17%	0.15%	0.12%	0.11%	0.10%	0.07%	0.07%	0.07%	0.06%	0.07%	0.06%	0.06%	0.06%	0.06%	0.06%
2017	0.00%	0.08%	0.36%	0.47%	0.80%	1.15%	1.10%	0.90%	0.66%	0.53%	0.43%	0.37%	0.33%	0.26%	0.25%	0.20%	0.17%	0.16%	0.14%	0.13%	0.10%	0.10%	0.09%	0.09%	0.09%	0.10%	0.09%	0.07%	0.08%	0.08%
2018	0.00%	0.12%	0.38%	0.88%	1.45%	1.60%	1.55%	1.31%	1.03%	0.91%	0.71%	0.61%	0.51%	0.43%	0.37%	0.32%	0.28%	0.24%	0.22%	0.21%	0.18%	0.16%	0.15%	0.15%	0.15%	0.15%	0.14%	0.16%	0.13%	0.13%
2019	0.00%	0.07%	0.65%	1.20%	1.49%	1.55%	1.34%	1.07%	0.92%	0.82%	0.69%	0.60%	0.49%	0.41%	0.37%	0.33%	0.29%	0.26%	0.23%	0.20%	0.20%	0.16%	0.15%	0.15%	0.13%	0.13%	0.13%	0.13%	0.14%	0.14%
2020	0.00%	0.18%	0.46%	0.66%	0.80%	0.76%	0.70%	0.65%	0.55%	0.49%	0.45%	0.39%	0.35%	0.31%	0.29%	0.27%	0.24%	0.21%	0.18%	0.17%	0.14%	0.12%	0.11%	0.11%	0.11%	0.09%	0.10%	0.10%	0.08%	0.09%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Cumulative Claim Rate
FRM30

Table 4: Cumulative Number of Claims as of Each Evaluation Year
Total Number of Claims for each Fiscal Year as of the End of the Evaluation Year

	Evaluation Year																													
Fiscal Year	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	55	1,981	9,425	19,835	29,441	36,489	41,499	45,832	49,109	51,480	53,146	54,144	54,871	55,465	55,899	56,191	56,406	56,573	56,730	56,856	57,000	57,141	57,241	57,355	57,424	57,486	57,566	57,618	57,661	57,694
1991	40	1,577	7,381	14,608	20,797	25,513	29,728	33,057	35,440	37,173	38,183	38,920	39,455	39,869	40,156	40,350	40,474	40,610	40,721	40,843	40,977	41,088	41,199	41,270	41,351	41,448	41,500	41,540	41,578	41,594
1992	20	981	4,244	8,423	12,422	16,477	19,997	22,771	24,664	25,869	26,723	27,310	27,749	28,013	28,205	28,336	28,470	28,575	28,679	28,807	28,909	29,015	29,084	29,171	29,256	29,323	29,369	29,397	29,408	29,416
1993	36	1,246	5,327	11,047	18,128	24,664	29,850	33,426	35,523	37,020	38,132	38,911	39,393	39,700	39,911	40,096	40,282	40,500	40,728	40,898	41,114	41,267	41,457	41,656	41,802	41,883	41,940	41,966	41,992	42,021
1994	54	1,789	6,930	14,734	23,223	30,454	35,487	38,619	40,933	42,635	43,804	44,568	45,033	45,381	45,650	45,934	46,316	46,618	46,890	47,232	47,496	47,728	47,987	48,154	48,280	48,358	48,395	48,430	48,475	48,537
1995	25	870	4,464	10,347	16,015	20,350	23,220	25,232	27,053	28,306	29,054	29,521	29,875	30,156	30,440	30,745	31,019	31,236	31,466	31,639	31,836	32,049	32,195	32,304	32,379	32,408	32,433	32,468	32,501	32,531
1996	19	1,462	7,769	16,683	24,237	29,639	33,599	37,108	39,497	40,969	41,884	42,511	43,034	43,521	44,100	44,569	45,018	45,451	45,778	46,153	46,556	46,838	47,043	47,181	47,244	47,299	47,346	47,404	47,471	47,520
1997	28	1,490	7,107	14,153	19,750	24,605	28,833	31,817	33,736	34,918	35,714	36,398	36,973	37,620	38,186	38,669	39,218	39,632	40,052	40,509	40,847	41,082	41,248	41,333	41,400	41,476	41,555	41,610	41,678	41,739
1998	28	2,056	9,864	18,659	27,111	35,406	41,090	44,779	47,066	48,648	49,942	51,150	52,492	53,666	54,740	55,878	56,767	57,664	58,591	59,178	59,569	59,818	59,954	60,046	60,181	60,314	60,434	60,542	60,633	60,714
1999	43	2,869	12,169	24,916	39,278	49,573	56,013	59,822	62,360	64,456	66,342	68,362	70,282	71,928	73,675	74,957	76,215	77,497	78,330	78,964	79,338	79,537	79,694	79,865	80,081	80,255	80,412	80,549	80,653	80,737
2000	53	2,766	13,554	28,681	39,678	46,089	49,787	52,281	54,309	55,940	57,654	59,078	60,277	61,525	62,458	63,390	64,301	64,941	65,440	65,730	65,900	65,999	66,133	66,264	66,396	66,510	66,606	66,683	66,741	66,800
2001	18	3,440	17,813	33,960	45,188	52,083	56,650	60,380	63,499	66,916	69,918	72,465	75,046	76,909	78,723	80,392	81,544	82,267	82,761	83,015	83,186	83,389	83,597	83,770	83,920	84,061	84,176	84,287	84,368	84,437
2002	44	3,933	17,114	29,961	38,778	44,984	49,958	54,466	59,374	63,578	67,422	71,418	74,229	76,837	79,291	80,885	81,930	82,681	82,992	83,225	83,484	83,729	83,930	84,096	84,238	84,349	84,473	84,583	84,699	84,779
2003	40	4,485	14,279	22,863	29,659	35,948	42,069	49,439	55,686	61,925	68,677	73,509	77,377	80,722	82,812	84,132	84,951	85,318	85,650	85,970	86,274	86,559	86,757	86,956	87,120	87,283	87,432	87,569	87,704	87,805
2004	562	6,456	15,431	24,602	33,894	42,932	53,332	61,914	70,782	80,243	86,994	92,586	97,339	100,308	102,159	103,345	103,903	104,403	104,860	105,272	105,681	105,975	106,232	106,450	106,665	106,869	107,048	107,215	107,353	107,489
2005	202	2,865	9,288	17,106	25,756	35,365	43,484	51,640	60,338	66,578	71,677	75,993	78,793	80,489	81,612	82,086	82,510	82,880	83,187	83,494	83,695	83,882	84,041	84,190	84,341	84,475	84,598	84,722	84,836	84,915
2006	98	2,787	10,568	21,380	34,047	44,021	53,856	64,613	72,081	78,079	83,088	86,306	88,471	89,809	90,472	90,948	91,358	91,714	92,061	92,308	92,516	92,692	92,833	92,970	93,111	93,220	93,321	93,430	93,512	93,599
2007	102	3,608	14,565	29,774	41,197	53,820	69,859	80,083	87,687	94,173	98,515	101,211	103,037	103,981	104,544	105,139	105,630	106,076	106,406	106,662	106,874	107,073	107,236	107,415	107,567	107,721	107,838	107,971	108,080	108,165
2008	174	7,699	33,666	59,356	90,258	132,692	159,787	178,944	194,971	205,345	211,733	216,146	218,442	219,738	221,035	222,180	223,191	223,899	224,503	225,024	225,450	225,789	226,133	226,429	226,721	227,007	227,272	227,509	227,716	227,921
2009	291	9,290	29,529	59,736	106,254	141,020	166,596	187,808	202,022	211,086	217,044	220,169	221,966	223,760	225,332	226,785	227,754	228,583	229,205	229,768	230,211	230,597	230,914	231,181	231,460	231,725	231,990	232,229	232,440	232,612
2010	145	3,462	13,892	33,949	53,391	70,394	84,355	94,376	101,177	105,913	108,149	109,801	111,469	112,774	113,856	114,667	115,385	115,989	116,461	116,843	117,191	117,486	117,779	118,024	118,282	118,522	118,726	118,907	119,097	119,256
2011	107	2,192	8,514	15,986	23,413	30,261	35,742	39,448	42,047	43,311	44,413	45,585	46,543	47,321	47,960	48,436	48,849	49,201	49,482	49,742	49,958	50,143	50,318	50,464	50,645	50,776	50,909	51,044	51,161	51,271
2012	75	1,590	5,215	10,072	15,716	20,449	23,951	26,573	27,803	29,077	30,232	31,187	31,965	32,578	33,176	33,676	34,085	34,418	34,751	35,016	35,249	35,447	35,652	35,812	35,983	36,136	36,302	36,456	36,589	36,698
2013	94	1,541	5,262	10,715	16,403	20,927	24,372	26,138	28,080	30,208	31,994	33,614	34,952	36,219	37,411	38,496	39,397	40,202	40,879	41,502	42,031	42,439	42,833	43,225	43,576	43,907	44,206	44,472	44,767	45,001
2014	18	787	3,293	7,128	10,506	13,364	14,888	16,239	17,601	18,857	19,810	20,522	21,172	21,696	22,108	22,497	22,848	23,137	23,393	23,588	23,793	23,937	24,069	24,211	24,356	24,472	24,559	24,668	24,765	24,848
2015	18	725	3,744	7,779	11,910	14,411	16,715	19,339	21,478	23,167	24,268	25,125	25,876	26,513	27,063	27,541	27,957	28,298	28,628	28,883	29,112	29,315	29,466	29,621	29,779	29,925	30,033	30,158	30,271	30,375
2016	17	913	4,106	8,737	12,057	15,933	19,848	23,284	26,096	28,029	29,575	30,862	31,917	32,867	33,691	34,389	34,991	35,480	35,887	36,255	36,511	36,760	36,992	37,200	37,419	37,615	37,800	37,968	38,133	38,292
2017	25	948	4,496	8,151	13,776	21,301	27,999	33,155	36,768	39,559	41,709	43,514	45,053	46,221	47,302	48,166	48,881	49,506	50,055	50,548	50,929	51,279	51,587	51,894	52,175	52,479	52,744	52,946	53,170	53,356
2018	24	1,094	3,639	8,797	16,504	24,207	31,036	36,411	40,401	43,715	46,163	48,166	49,778	51,086	52,157	53,068	53,848	54,488	55,056	55,591	56,017	56,390	56,721	57,047	57,370	57,663	57,937	58,234	58,470	58,675
2019	30	527	4,513	11,096	18,437	25,392	30,910	35,018	38,334	41,117	43,343	45,160	46,576	47,707	48,707	49,548	50,262	50,883	51,424	51,870	52,300	52,642	52,942	53,244	53,493	53,731	53,957	54,174	54,397	54,601
2020	5	2,156	7,228	14,155	22,087	29,231	35,480	41,048	45,599	49,517	52,942	55,843	58,370	60,565	62,534	64,316	65,896	67,261	68,415	69,439	70,271	70,995	71,645	72,266	72,837	73,320	73,812	74,271	74,645	74,991

Table 5: Cumulative Claim Rate = Table 4 / Table 1 (Evaluation Year 1)
Cumulative Claims as of Evaluation Year Divided by Active Loans as of Evaluation Year 1

	Evaluation Year																													
Fiscal Year	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	0.01%	0.29%	1.38%	2.91%	4.31%	5.34%	6.08%	6.71%	7.19%	7.54%	7.78%	7.93%	8.04%	8.12%	8.19%	8.23%	8.26%	8.29%	8.31%	8.33%	8.35%	8.37%	8.38%	8.40%	8.41%	8.42%	8.43%	8.44%	8.45%	8.45%
1991	0.01%	0.28%	1.31%	2.60%	3.70%	4.54%	5.29%	5.89%	6.31%	6.62%	6.80%	6.93%	7.03%	7.10%	7.15%	7.18%	7.21%	7.23%	7.25%	7.27%	7.30%	7.32%	7.34%	7.35%	7.36%	7.38%	7.39%	7.40%	7.40%	7.41%
1992	0.00%	0.21%	0.89%	1.77%	2.60%	3.45%	4.19%	4.77%	5.17%	5.42%	5.60%	5.72%	5.82%	5.87%	5.91%	5.94%	5.97%	5.99%	6.01%	6.04%	6.06%	6.08%	6.10%	6.12%	6.13%	6.15%	6.16%	6.16%	6.16%	6.17%
1993	0.00%	0.17%	0.74%	1.53%	2.51%	3.42%	4.14%	4.63%	4.92%	5.13%	5.29%	5.39%	5.46%	5.50%	5.53%	5.56%	5.58%	5.61%	5.64%	5.67%	5.70%	5.72%	5.75%	5.77%	5.79%	5.81%	5.81%	5.82%	5.82%	5.82%
1994	0.01%	0.23%	0.90%	1.91%	3.01%	3.95%	4.60%	5.00%	5.30%	5.53%	5.68%	5.78%	5.84%	5.88%	5.92%	5.95%	6.00%	6.04%	6.08%	6.12%	6.16%	6.19%	6.22%	6.24%	6.26%	6.27%	6.27%	6.28%	6.28%	6.29%
1995	0.01%	0.24%	1.25%	2.89%	4.47%	5.68%	6.48%	7.04%	7.55%	7.90%	8.11%	8.24%	8.34%	8.42%	8.50%	8.58%	8.66%	8.72%	8.79%	8.83%	8.89%	8.95%	8.99%	9.02%	9.04%	9.05%	9.06%	9.07%	9.07%	9.08%
1996	0.00%	0.27%	1.44%	3.08%	4.48%	5.48%	6.21%	6.86%	7.30%	7.57%	7.74%	7.86%	7.95%	8.04%	8.15%	8.24%	8.32%	8.40%	8.46%	8.53%	8.61%	8.66%	8.70%	8.72%	8.73%	8.74%	8.75%	8.76%	8.77%	8.78%
1997	0.01%	0.31%	1.46%	2.90%	4.04%	5.04%	5.90%	6.52%	6.91%	7.15%	7.31%	7.45%	7.57%	7.70%	7.82%	7.92%	8.03%	8.12%	8.20%	8.30%	8.36%	8.41%	8.45%	8.46%	8.48%	8.49%	8.51%	8.52%	8.53%	8.55%
1998	0.00%	0.24%	1.16%	2.19%	3.18%	4.15%	4.81%	5.25%	5.52%	5.70%	5.85%	5.99%	6.15%	6.29%	6.41%	6.55%	6.65%	6.76%	6.87%	6.93%	6.98%	7.01%	7.03%	7.04%	7.05%	7.07%	7.08%	7.09%	7.11%	7.11%
1999	0.00%	0.28%	1.20%	2.45%	3.86%	4.87%	5.51%	5.88%	6.13%	6.34%	6.52%	6.72%	6.91%	7.07%	7.24%	7.37%	7.49%	7.62%	7.70%	7.76%	7.80%	7.82%	7.83%	7.85%	7.87%	7.89%	7.90%	7.92%	7.93%	7.94%
2000	0.01%	0.38%	1.87%	3.96%	5.47%	6.36%	6.87%	7.21%	7.49%	7.72%	7.95%	8.15%	8.31%	8.49%	8.61%	8.74%	8.87%	8.96%	9.03%	9.07%	9.09%	9.10%	9.12%	9.14%	9.16%	9.17%	9.19%	9.20%	9.20%	9.21%
2001	0.00%	0.35%	1.81%	3.45%	4.59%	5.29%	5.76%	6.13%	6.45%	6.80%	7.10%	7.36%	7.62%	7.81%	8.00%	8.17%	8.28%	8.36%	8.41%	8.43%	8.45%	8.47%	8.49%	8.51%	8.53%	8.54%	8.55%	8.56%	8.57%	8.58%
2002	0.00%	0.41%	1.80%	3.15%	4.07%	4.72%	5.25%	5.72%	6.24%	6.68%	7.08%	7.50%	7.80%	8.07%	8.33%	8.49%	8.60%	8.68%	8.72%	8.74%	8.77%	8.79%	8.81%	8.83%	8.85%	8.86%	8.87%	8.88%	8.89%	8.90%
2003	0.01%	0.57%	1.82%	2.91%	3.78%	4.58%	5.36%	6.30%	7.09%	7.89%	8.75%	9.36%	9.85%	10.28%	10.55%	10.71%	10.82%	10.87%	10.91%	10.95%	10.99%	11.02%	11.05%	11.07%	11.10%	11.12%	11.14%	11.15%	11.17%	11.18%
2004	0.08%	0.91%	2.18%	3.47%	4.79%	6.06%	7.53%	8.74%	9.99%	11.33%	12.28%	13.07%	13.74%	14.16%	14.42%	14.59%	14.67%	14.74%	14.81%	14.86%	14.92%	14.96%	15.00%	15.03%	15.06%	15.09%	15.11%	15.14%	15.16%	15.18%
2005	0.05%	0.73%	2.35%	4.33%	6.52%	8.96%	11.01%	13.08%	15.28%	16.86%	18.16%	19.25%	19.96%	20.39%	20.67%	20.79%	20.90%	20.99%	21.07%	21.15%	21.20%	21.25%	21.29%	21.33%	21.36%	21.40%	21.43%	21.46%	21.49%	21.51%
2006	0.03%	0.75%	2.83%	5.73%	9.12%	11.80%	14.43%	17.31%	19.31%	20.92%	22.26%	23.13%	23.71%	24.06%	24.24%	24.37%	24.48%	24.57%	24.67%	24.73%	24.79%	24.84%	24.87%	24.91%	24.95%	24.98%	25.01%	25.03%	25.06%	25.08%
2007	0.03%	0.94%	3.79%	7.75%	10.72%	14.00%	18.18%	20.84%	22.81%	24.50%	25.63%	26.33%	26.81%	27.05%	27.20%	27.35%	27.48%	27.60%	27.68%	27.75%	27.81%	27.86%	27.90%	27.95%	27.99%	28.03%	28.06%	28.09%	28.12%	28.14%
2008	0.02%	0.79%	3.46%	6.10%	9.28%	13.64%	16.42%	18.39%	20.04%	21.10%	21.76%	22.21%	22.45%	22.58%	22.71%	22.83%	22.94%	23.01%	23.07%	23.12%	23.17%	23.20%	23.24%	23.27%	23.30%	23.33%	23.36%	23.38%	23.40%	23.42%
2009	0.02%	0.56%	1.78%	3.61%	6.41%	8.51%	10.06%	11.34%	12.19%	12.74%	13.10%	13.29%	13.40%	13.51%	13.60%	13.69%	13.75%	13.80%	13.84%	13.87%	13.90%	13.92%	13.94%	13.95%	13.97%	13.99%	14.00%	14.02%	14.03%	14.04%
2010	0.01%	0.23%	0.92%	2.24%	3.53%	4.65%	5.58%	6.24%	6.69%	7.00%	7.15%	7.26%	7.37%	7.46%	7.53%	7.58%	7.63%	7.67%	7.70%	7.73%	7.75%	7.77%	7.79%	7.80%	7.82%	7.84%	7.85%	7.86%	7.87%	7.89%
2011	0.01%	0.21%	0.81%	1.52%	2.22%	2.87%	3.40%	3.75%	3.99%	4.11%	4.22%	4.33%	4.42%	4.50%	4.56%	4.60%	4.64%	4.67%	4.70%	4.73%	4.75%	4.76%	4.78%	4.79%	4.81%	4.82%	4.84%	4.85%	4.86%	4.87%
2012	0.01%	0.15%	0.49%	0.95%	1.49%	1.94%	2.27%	2.52%	2.64%	2.76%	2.87%	2.96%	3.03%	3.09%	3.14%	3.19%	3.23%	3.26%	3.29%	3.32%	3.34%	3.36%	3.38%	3.39%	3.41%	3.43%	3.44%	3.46%	3.47%	3.48%
2013	0.01%	0.12%	0.42%	0.85%	1.30%	1.66%	1.94%	2.08%	2.23%	2.40%	2.55%	2.67%	2.78%	2.88%	2.98%	3.06%	3.13%	3.20%	3.25%	3.30%	3.34%	3.38%	3.41%	3.44%	3.47%	3.49%	3.52%	3.54%	3.56%	3.58%
2014	0.00%	0.11%	0.45%	0.98%	1.45%	1.84%	2.05%	2.24%	2.42%	2.60%	2.73%	2.83%	2.92%	2.99%	3.05%	3.10%	3.15%	3.19%	3.22%	3.25%	3.28%	3.30%	3.32%	3.33%	3.35%	3.37%	3.38%	3.40%	3.41%	3.42%
2015	0.00%	0.07%	0.36%	0.75%	1.14%	1.39%	1.61%	1.86%	2.06%	2.23%	2.33%	2.41%	2.49%	2.55%	2.60%	2.65%	2.69%	2.72%	2.75%	2.78%	2.80%	2.82%	2.83%	2.85%	2.86%	2.88%	2.89%	2.90%	2.91%	2.92%
2016	0.00%	0.08%	0.35%	0.74%	1.02%	1.34%	1.67%	1.96%	2.20%	2.36%	2.49%	2.60%	2.69%	2.77%	2.84%	2.90%	2.95%	2.99%	3.02%	3.05%	3.08%	3.10%	3.12%	3.13%	3.15%	3.17%	3.18%	3.20%	3.21%	3.23%
2017	0.00%	0.08%	0.38%	0.69%	1.16%	1.79%	2.36%	2.79%	3.09%	3.33%	3.51%	3.66%	3.79%	3.89%	3.98%	4.05%	4.11%	4.17%	4.21%	4.25%	4.29%	4.31%	4.34%	4.37%	4.39%	4.42%	4.44%	4.45%	4.47%	4.49%
2018	0.00%	0.11%	0.37%	0.90%	1.69%	2.48%	3.18%	3.73%	4.14%	4.48%	4.73%	4.94%	5.10%	5.23%	5.34%	5.44%	5.52%	5.58%	5.64%	5.70%	5.74%	5.78%	5.81%	5.85%	5.88%	5.91%	5.94%	5.97%	5.99%	6.01%
2019	0.00%	0.06%	0.49%	1.19%	1.98%	2.73%	3.32%	3.76%	4.12%	4.42%	4.66%	4.85%	5.01%	5.13%	5.24%	5.33%	5.40%	5.47%	5.53%	5.57%	5.62%	5.66%	5.69%	5.72%	5.75%	5.77%	5.80%	5.82%	5.85%	5.87%
2020	0.00%	0.17%	0.58%	1.14%	1.78%	2.36%	2.86%	3.31%	3.68%	3.99%	4.27%	4.50%	4.71%	4.88%	5.04%	5.19%	5.31%	5.42%	5.52%	5.60%	5.67%	5.72%	5.78%	5.83%	5.87%	5.91%	5.95%	5.99%	6.02%	6.05%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Conditional Non-Claim Termination Rate
FRM30

Table 6: Number of Non-Claim Terminations in Each Evaluation Year

	Evaluation Year																												
Fiscal Year	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	2,291	13,725	66,834	178,977	120,914	23,606	31,604	21,821	30,790	29,066	12,439	13,400	16,345	15,256	9,850	6,098	6,643	2,433	1,698	1,555	1,095	1,166	940	948	1,054	976	949	993	1,312	1,911
1991	1,638	27,510	129,286	116,245	21,552	31,647	22,255	33,698	30,930	12,334	14,379	17,546	16,691	10,152	5,944	5,530	2,365	1,584	1,404	960	1,069	851	824	843	848	808	826	913	1,063	1,552
1992	3,071	43,606	73,552	22,501	34,980	27,460	46,611	46,331	17,080	22,060	28,231	28,917	14,722	8,168	5,378	3,246	2,166	1,665	1,358	1,213	1,090	1,115	1,068	998	1,059	1,039	1,029	1,097	1,287	674
1993	11,115	49,481	30,468	49,493	45,203	72,599	81,680	37,547	48,907	64,847	79,701	35,112	18,655	11,403	6,644	4,604	3,542	3,021	2,576	2,435	2,479	2,105	2,052	1,902	1,936	1,839	1,738	1,851	1,114	945
1994	7,790	23,327	52,801	47,893	79,410	87,785	43,167	56,833	73,810	96,721	45,958	25,451	14,980	9,099	6,176	4,700	3,925	3,538	3,398	3,612	2,899	2,608	2,671	2,592	2,562	2,272	2,256	1,483	1,323	1,251
1995	5,058	26,679	21,347	47,200	46,632	18,962	26,953	33,366	36,557	19,571	11,487	6,874	4,208	2,459	1,546	1,283	1,108	1,086	1,138	962	1,017	961	993	874	887	879	773	787	811	717
1996	2,595	15,944	64,137	76,529	31,419	49,241	63,329	71,764	36,516	21,047	12,262	7,280	4,338	2,893	2,182	1,924	1,845	2,064	1,758	1,675	1,647	1,577	1,486	1,431	1,415	1,372	1,243	1,426	1,296	1,106
1997	2,900	44,567	70,039	27,981	48,453	63,539	71,516	36,545	21,193	12,117	7,074	4,345	2,786	2,063	1,760	1,786	1,963	1,630	1,630	1,588	1,660	1,475	1,359	1,283	1,358	1,281	1,375	1,249	1,085	848
1998	9,934	57,887	46,204	92,053	136,061	189,463	90,197	49,898	26,775	15,561	9,325	6,802	4,866	4,046	3,886	4,705	3,544	3,391	3,330	3,372	2,979	2,558	2,558	2,745	2,498	2,656	2,291	1,976	1,679	1,489
1999	7,394	31,373	124,148	185,284	240,860	117,340	66,874	35,418	20,383	12,307	8,860	6,325	5,335	5,159	6,356	4,570	4,467	4,291	4,275	3,784	3,398	3,210	3,241	2,957	3,210	2,987	2,444	2,000	1,933	1,783
2000	4,387	174,561	178,135	131,775	60,497	33,735	17,986	9,938	5,525	3,636	2,425	1,887	1,922	2,255	1,870	1,811	1,801	1,688	1,590	1,404	1,380	1,412	1,355	1,523	1,453	1,232	1,059	1,023	1,009	912
2001	31,231	169,571	338,030	142,507	76,041	38,907	21,525	12,858	10,306	6,529	4,999	5,020	6,525	4,454	3,987	3,940	3,866	3,375	2,911	2,834	2,829	2,543	2,633	2,519	2,192	1,805	1,795	1,723	1,614	1,563
2002	32,565	311,466	181,568	108,014	54,830	31,734	19,714	17,952	11,657	9,121	9,275	12,442	7,668	6,636	6,156	6,200	5,223	4,541	4,291	3,875	3,332	3,340	3,130	2,559	2,274	2,203	2,097	2,105	2,118	1,883
2003	55,128	130,712	138,990	78,998	47,639	28,566	26,214	19,156	16,584	19,498	27,876	14,420	12,988	12,047	11,500	9,279	7,809	7,874	5,116	3,873	3,819	3,377	2,959	2,630	2,644	2,639	2,573	2,559	2,459	2,300
2004	38,686	122,251	82,035	51,916	30,681	29,200	21,072	17,883	21,828	32,996	16,834	14,817	13,527	12,925	10,508	8,807	8,938	6,069	4,691	4,682	4,032	3,396	3,024	2,964	3,047	3,016	3,010	2,890	2,716	2,511
2005	16,239	34,322	30,840	19,841	19,218	14,250	12,201	16,273	25,621	12,449	10,956	9,948	9,207	7,210	6,116	6,406	3,534	2,446	2,455	2,227	1,846	1,673	1,605	1,701	1,754	1,765	1,754	1,781	1,782	1,616
2006	5,616	25,097	27,159	32,787	18,513	13,905	17,829	26,015	12,527	10,596	8,883	8,054	6,155	4,987	4,904	3,451	2,354	2,289	2,094	1,794	1,542	1,456	1,520	1,605	1,590	1,632	1,621	1,665	1,611	1,520
2007	5,801	37,420	46,876	20,887	13,929	17,182	25,298	13,249	10,380	8,590	8,061	5,954	4,672	4,592	3,431	2,636	2,388	2,097	1,717	1,556	1,519	1,513	1,492	1,511	1,626	1,598	1,592	1,582	1,554	1,514
2008	21,625	180,285	82,032	47,213	61,584	85,228	39,660	28,445	23,527	21,280	15,478	12,027	11,826	8,740	6,403	5,691	4,752	3,637	3,305	3,198	3,244	3,261	3,431	3,397	3,549	3,591	3,682	3,620	3,440	3,242
2009	98,063	126,882	100,438	179,364	232,820	94,056	102,751	91,524	71,950	47,054	35,459	39,016	22,959	15,382	12,228	9,440	7,536	6,416	6,065	6,197	6,293	6,621	6,602	6,524	6,780	6,743	6,870	6,939	6,759	6,319
2010	21,781	59,322	120,570	188,434	101,685	147,709	130,223	100,930	66,518	49,477	58,046	34,651	21,911	16,787	12,629	9,636	8,104	7,113	6,961	7,242	7,352	7,389	7,390	7,611	7,846	7,883	7,935	7,741	7,705	7,085
2011	4,699	68,191	128,481	80,809	114,717	100,585	78,339	52,118	39,539	46,569	25,529	15,681	12,382	9,350	7,165	5,845	5,227	4,775	4,743	5,078	5,063	4,906	5,342	5,333	5,456	5,599	5,650	5,427	5,483	5,164
2012	8,504	79,971	80,680	125,919	109,773	90,813	63,199	48,070	54,498	23,305	15,347	12,785	9,950	7,670	6,454	5,719	5,250	4,888	4,805	5,008	4,984	5,171	5,321	5,529	5,609	5,855	5,944	6,020	6,095	5,933
2013	12,078	59,346	140,303	131,555	114,602	88,154	69,045	76,604	24,724	15,828	14,363	11,685	9,372	7,685	6,925	6,338	6,148	5,774	5,807	5,780	6,060	6,159	6,413	6,676	6,770	7,103	7,347	7,406	7,207	6,888
2014	10,897	156,756	95,872	71,824	49,901	39,065	43,438	18,995	11,571	9,834	8,180	6,227	5,050	4,299	3,974	3,572	3,246	3,096	2,972	3,079	3,120	3,108	3,256	3,239	3,485	3,457	3,606	3,587	3,536	3,413
2015	32,755	142,198	129,800	98,236	81,326	103,731	37,690	23,305	18,984	14,969	12,589	10,407	9,357	8,203	7,472	6,836	5,995	5,615	5,586	5,720	5,734	5,670	6,063	6,088	6,039	6,561	6,389	6,648	6,651	6,446
2016	34,570	114,839	109,748	109,965	153,279	58,978	38,428	31,483	24,621	20,069	17,423	15,484	13,581	12,134	11,066	9,901	8,916	8,044	7,970	7,988	8,256	8,351	8,525	8,952	9,015	9,311	9,409	9,482	9,301	9,007
2017	21,315	96,343	114,287	192,556	64,612	43,891	38,913	30,711	24,360	20,507	19,611	17,845	15,636	14,249	12,236	11,033	9,954	9,278	8,979	9,152	9,195	9,214	9,523	9,672	9,993	9,952	10,361	10,277	10,085	9,428
2018	14,007	115,823	193,078	71,380	49,340	42,071	33,048	24,871	20,139	17,514	16,208	14,697	12,727	11,053	9,676	8,598	7,723	7,162	6,951	6,806	6,918	7,084	7,119	7,257	7,433	7,583	7,681	7,496	7,414	7,036
2019	40,557	230,794	82,505	57,574	46,922	38,766	29,994	24,164	20,419	17,792	16,630	15,082	12,702	10,992	9,660	8,664	7,627	6,944	6,824	6,782	6,888	6,940	6,980	7,074	7,322	7,179	7,438	7,387	7,099	6,945
2020	52,203	63,685	58,098	55,048	49,062	43,265	37,416	33,538	29,270	26,748	25,214	22,154	19,380	17,327	15,653	14,278	13,204	12,147	12,004	12,341	12,361	12,611	13,027	13,554	13,841	13,899	14,377	14,429	14,052	13,394

Table 7: Non-Claim Termination Rate = Table 6 / Table 1
Percentage of Active Loans at the Beginnng of the Evaluation Year that end in Termination by Other Than Claim During the Evaluation Year

	Evaluation Year																												
Fiscal Year	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	0.34%	2.06%	11.27%	44.36%	44.30%	9.74%	15.37%	12.16%	21.17%	25.49%	12.45%	15.67%	23.88%	29.01%	23.28%	16.98%	22.86%	9.20%	6.90%	6.80%	5.13%	5.82%	4.95%	5.29%	6.30%	6.31%	6.58%	7.43%	11.03%	20.41%
1991	0.29%	5.17%	32.53%	42.42%	8.75%	15.08%	12.13%	23.02%	27.35%	12.45%	17.19%	26.84%	34.67%	27.02%	18.96%	21.59%	10.23%	7.40%	7.06%	5.11%	6.15%	5.19%	5.33%	5.80%	6.25%	6.43%	7.08%	8.53%	11.13%	20.57%
1992	0.64%	10.08%	20.68%	6.84%	12.06%	10.62%	22.37%	29.09%	12.18%	18.85%	32.11%	49.50%	34.03%	23.45%	18.38%	12.54%	9.19%	7.64%	6.68%	6.40%	6.22%	6.85%	7.05%	7.10%	8.21%	8.90%	9.72%	11.61%	15.82%	9.43%
1993	1.54%	7.38%	4.79%	8.52%	8.55%	16.15%	22.52%	11.67%	18.07%	31.74%	64.55%	40.09%	27.26%	20.10%	13.32%	10.21%	8.56%	7.93%	7.30%	7.46%	8.47%	7.80%	8.30%	8.41%	9.46%	10.10%	10.63%	12.81%	8.40%	8.19%
1994	1.01%	3.12%	7.67%	7.57%	14.57%	19.51%	10.74%	16.63%	27.78%	57.81%	38.24%	27.09%	19.08%	13.18%	9.86%	8.16%	7.36%	7.16%	7.43%	8.71%	7.76%	7.57%	8.48%	9.02%	9.89%	9.87%	10.92%	7.77%	7.52%	8.74%
1995	1.41%	8.07%	6.98%	18.68%	23.28%	10.71%	18.31%	29.84%	49.78%	37.19%	28.45%	20.80%	14.78%	9.55%	6.47%	5.75%	5.29%	5.53%	6.24%	5.63%	6.45%	6.59%	7.39%	7.03%	7.74%	8.38%	7.98%	8.89%	10.22%	10.59%
1996	0.48%	3.04%	14.15%	20.81%	9.56%	17.96%	30.62%	54.55%	39.41%	30.01%	21.53%	14.84%	9.81%	7.09%	5.73%	5.39%	5.53%	6.69%	6.11%	6.27%	6.71%	6.96%	7.09%	7.38%	7.90%	8.37%	8.24%	10.49%	10.62%	10.50%
1997	0.59%	10.08%	19.10%	8.44%	17.46%	30.37%	53.59%	38.91%	29.93%	21.07%	14.25%	9.74%	6.75%	5.35%	4.86%	5.26%	6.25%	5.55%	5.96%	6.28%	7.18%	6.89%	6.84%	6.93%	7.95%	8.18%	9.69%	9.70%	9.27%	8.18%
1998	1.16%	7.30%	6.25%	14.41%	27.54%	63.94%	45.00%	33.98%	22.73%	15.46%	10.36%	8.29%	6.42%	5.73%	5.92%	7.87%	6.40%	6.64%	7.11%	7.87%	7.61%	7.04%	7.61%	8.91%	8.87%	10.55%	10.09%	9.58%	8.95%	8.89%
1999	0.73%	3.19%	14.61%	28.43%	60.76%	43.66%	34.22%	22.67%	15.29%	10.35%	8.19%	6.34%	5.76%	6.02%	8.19%	6.37%	6.76%	7.09%	7.72%	7.43%	7.25%	7.39%	8.09%	8.01%	9.59%	9.94%	8.91%	7.91%	8.34%	8.78%
2000	0.61%	31.87%	49.64%	62.17%	43.06%	33.62%	22.87%	15.01%	9.42%	6.81%	4.92%	4.11%	4.49%	5.73%	5.12%	5.36%	5.80%	5.87%	5.97%	5.63%	5.94%	6.50%	6.70%	8.20%	8.56%	7.90%	7.34%	7.67%	8.24%	8.56%
2001	3.17%	20.90%	73.66%	47.46%	35.70%	23.27%	15.26%	10.33%	9.28%	6.46%	5.37%	5.87%	8.54%	6.35%	6.20%	6.71%	7.20%	6.80%	6.30%	6.58%	7.14%	6.92%	7.76%	8.07%	7.59%	6.74%	7.22%	7.49%	7.59%	8.12%
2002	3.42%	48.91%	41.07%	33.62%	21.28%	14.45%	10.11%	10.41%	7.47%	6.39%	7.16%	11.00%	7.47%	7.11%	7.26%	8.06%	7.39%	6.94%	7.06%	6.84%	6.39%	6.91%	6.96%	6.05%	5.71%	5.91%	6.01%	6.44%	6.98%	6.94%
2003	7.02%	20.11%	27.73%	19.10%	13.26%	8.81%	8.98%	7.21%	6.83%	8.99%	15.29%	8.84%	8.88%	9.21%	9.81%	8.70%	7.97%	8.77%	6.07%	4.84%	5.19%	4.83%	4.44%	4.12%	4.33%	4.64%	4.76%	4.99%	5.08%	5.13%
2004	5.46%	21.07%	16.77%	12.13%	7.91%	8.35%	6.62%	6.13%	8.36%	15.09%	8.63%	8.48%	8.65%	9.20%	8.20%	7.45%	8.22%	5.94%	4.84%	5.13%	4.80%	4.23%	3.93%	4.02%	4.35%	4.62%	4.86%	4.92%	4.88%	5.88%
2005	4.11%	9.59%	9.62%	6.77%	7.25%	5.91%	5.53%	8.29%	15.81%	8.68%	8.60%	8.80%	9.11%	7.82%	7.20%	8.21%	4.77%	3.43%	3.58%	3.39%	3.00%	2.81%	2.78%	3.04%	3.26%	3.49%	3.61%	3.83%	4.01%	4.12%
2006	1.50%	7.27%	8.75%	12.29%	7.85%	6.56%	9.68%	17.65%	9.83%	9.56%	9.17%	9.41%	7.96%	7.03%	7.50%	5.61%	4.01%	4.08%	3.90%	3.48%	3.14%	3.07%	3.32%	3.65%	3.77%	4.09%	4.25%	4.58%	4.66%	5.23%
2007	1.51%	10.90%	16.41%	8.37%	6.21%	8.84%	16.53%	10.23%	9.30%	8.90%	9.59%	7.89%	6.78%	7.24%	5.78%	4.69%	4.48%	4.13%	3.53%	3.32%	3.39%	3.51%	3.60%	3.80%	4.29%	4.44%	4.64%	4.86%	5.03%	5.53%
2008	2.22%	22.96%	12.11%	7.81%	12.03%	22.18%	12.49%	10.54%	10.22%	10.71%	8.75%	7.50%	8.09%	6.42%	4.98%	4.68%	4.10%	3.26%	3.07%	3.08%	3.26%	3.40%	3.72%	3.84%	4.19%	4.47%	4.82%	4.99%	4.99%	5.17%
2009	5.92%	8.34%	7.17%	15.07%	25.55%	12.02%	15.71%	16.91%	15.81%	11.79%	9.92%	12.37%	7.90%	5.62%	4.71%	3.79%	3.14%	2.75%	2.68%	2.82%	2.98%	3.24%	3.35%	3.42%	3.70%	3.85%	4.09%	4.31%	4.40%	4.47%
2010	1.44%	4.09%	9.14%	16.97%	10.28%	17.92%	19.14%	17.73%	13.41%	11.20%	15.22%	10.04%	6.81%	5.53%	4.36%	3.45%	3.00%	2.71%	2.73%	2.92%	3.08%	3.20%	3.31%	3.53%	3.79%	3.98%	4.18%	4.25%	4.43%	4.55%
2011	0.45%	6.94%	15.16%	10.64%	18.01%	18.99%	17.57%	13.36%	11.36%	15.52%	9.34%	6.11%	5.09%	4.01%	3.18%	2.67%	2.45%	2.29%	2.33%	2.57%	2.64%	2.63%	2.95%	3.04%	3.21%	3.43%	3.59%	3.57%	3.75%	4.01%
2012	0.81%	8.21%	9.07%	16.60%	17.07%	16.59%	13.15%	11.18%	14.56%	6.66%	4.61%	4.00%	3.22%	2.55%	2.20%	1.99%	1.86%	1.77%	1.77%	1.88%	1.92%	2.03%	2.14%	2.28%	2.37%	2.55%	2.66%	2.78%	2.89%	3.01%
2013	0.96%	4.96%	13.33%	14.37%	14.42%	12.55%	10.96%	13.89%	4.71%	3.12%	2.93%	2.45%	2.01%	1.68%	1.54%	1.43%	1.41%	1.35%	1.38%	1.39%	1.50%	1.56%	1.65%	1.75%	1.82%	1.98%	2.10%	2.17%	2.16%	2.25%
2014	1.50%	27.57%	20.39%	18.21%	14.63%	13.05%	17.08%	8.12%	5.24%	4.68%	4.07%	3.21%	2.68%	2.35%	2.22%	2.04%	1.89%	1.84%	1.80%	1.91%	2.00%	2.03%	2.18%	2.23%	2.47%	2.57%	2.76%	2.83%	2.87%	3.05%
2015	3.15%	15.84%	16.97%	14.83%	14.10%	22.04%	8.75%	5.76%	4.95%	4.08%	3.56%	3.04%	2.82%	2.54%	2.37%	2.22%	1.99%	1.90%	1.93%	2.02%	2.08%	2.11%	2.31%	2.38%	2.43%	2.75%	2.75%	2.96%	3.05%	3.17%
2016	2.91%	10.72%	11.45%	13.03%	22.30%	9.45%	6.60%	5.75%	4.74%	4.03%	3.64%	3.35%	3.04%	2.79%	2.62%	2.40%	2.22%	2.04%	2.07%	2.12%	2.27%	2.35%	2.46%	2.67%	2.77%	2.99%	3.12%	3.25%	3.31%	3.54%
2017	1.79%	8.83%	11.74%	24.78%	9.14%	6.70%	6.38%	5.35%	4.46%	3.92%	3.91%	3.71%	3.37%	3.17%	2.81%	2.60%	2.41%	2.30%	2.28%	2.39%	2.49%	2.56%	2.73%	2.88%	3.07%	3.19%	3.45%	3.56%	3.67%	3.90%
2018	1.44%	13.48%	29.10%	12.16%	9.31%	8.76%	7.51%	6.07%	5.22%	4.80%	4.68%	4.46%	4.04%	3.65%	3.31%	3.04%	2.82%	2.69%	2.69%	2.71%	2.87%	3.03%	3.16%	3.33%	3.55%	3.79%	4.00%	4.08%	4.22%	4.51%
2019	4.36%	33.01%	13.47%	10.50%	9.49%	8.64%	7.26%	6.28%	5.66%	5.23%	5.17%	4.95%	4.37%	3.95%	3.61%	3.36%	3.05%	2.87%	2.90%	2.98%	3.15%	3.28%	3.42%	3.60%	3.87%	3.97%	4.30%	4.47%	4.51%	4.81%
2020	4.21%	5.42%	5.23%	5.25%	4.94%	4.59%	4.17%	3.90%	3.55%	3.37%	3.29%	2.99%	2.70%	2.48%	2.30%	2.14%	2.03%	1.91%	1.92%	2.02%	2.08%	2.17%	2.30%	2.46%	2.58%	2.70%	2.90%	3.04%	3.12%	3.30%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Cumulative Non-Claim Termination Rate
FRM30

Table 8: Cumulative Number of Non-Claim Terminations as of Each Evaluation Year
Total Number of Non-Claim Terminations for each Fiscal Year as of the End of the Evaluation Year

	Evaluation Year																													
Fiscal Year	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	2,291	16,016	82,850	261,827	382,741	406,347	437,951	459,772	490,562	519,628	532,067	545,467	561,812	577,068	586,918	593,016	599,659	602,092	603,790	605,345	606,440	607,606	608,546	609,494	610,548	611,524	612,473	613,466	614,778	616,689
1991	1,638	29,148	158,434	274,679	296,231	327,878	350,133	383,831	414,761	427,095	441,474	459,020	475,711	485,863	491,807	497,337	499,702	501,286	502,690	503,650	504,719	505,570	506,394	507,237	508,085	508,893	509,719	510,632	511,695	513,247
1992	3,071	46,677	120,229	142,730	177,710	205,170	251,781	298,112	315,192	337,252	365,483	394,400	409,122	417,290	422,668	425,914	428,080	429,745	431,103	432,316	433,406	434,521	435,589	436,587	437,646	438,685	439,714	440,811	442,098	442,772
1993	11,115	60,596	91,064	140,557	185,760	258,359	340,039	377,586	426,493	491,340	571,041	606,153	624,808	636,211	642,855	647,459	651,001	654,022	656,598	659,033	661,512	663,617	665,669	667,571	669,507	671,346	673,084	674,935	676,049	676,994
1994	7,790	31,117	83,918	131,811	211,221	299,006	342,173	399,006	472,816	569,537	615,495	640,946	655,926	665,025	671,201	675,901	679,826	683,364	686,762	690,374	693,273	695,881	698,552	701,144	703,706	705,978	708,234	709,717	711,040	712,291
1995	5,058	31,737	53,084	100,284	146,916	165,878	192,831	226,197	262,754	282,325	293,812	300,686	304,894	307,353	308,899	310,182	311,290	312,376	313,514	314,476	315,493	316,454	317,447	318,321	319,208	320,087	320,860	321,647	322,458	323,175
1996	2,595	18,539	82,676	159,205	190,624	239,865	303,194	374,958	411,474	432,521	444,783	452,063	456,401	459,294	461,476	463,400	465,245	467,309	469,067	470,742	472,389	473,966	475,452	476,883	478,298	479,670	480,913	482,339	483,635	484,741
1997	2,900	47,467	117,506	145,487	193,940	257,479	328,995	365,540	386,733	398,850	405,924	410,269	413,055	415,118	416,878	418,664	420,627	422,257	423,887	425,475	427,135	428,610	429,969	431,252	432,610	433,891	435,266	436,515	437,600	438,448
1998	9,934	67,821	114,025	206,078	342,139	531,602	621,799	671,697	698,472	714,033	723,358	730,160	735,026	739,072	742,958	747,663	751,207	754,598	757,928	761,300	764,279	766,837	769,395	772,140	774,638	777,294	779,585	781,561	783,240	784,729
1999	7,394	38,767	162,915	348,199	589,059	706,399	773,273	808,691	829,074	841,381	850,241	856,566	861,901	867,060	873,416	877,986	882,453	886,744	891,019	894,803	898,201	901,411	904,652	907,609	910,819	913,806	916,250	918,250	920,183	921,966
2000	4,387	178,948	357,083	488,858	549,355	583,090	601,076	611,014	616,539	620,175	622,600	624,487	626,409	628,664	630,534	632,345	634,146	635,834	637,424	638,828	640,208	641,620	642,975	644,498	645,951	647,183	648,242	649,265	650,274	651,186
2001	31,231	200,802	538,832	681,339	757,380	796,287	817,812	830,670	840,976	847,505	852,504	857,524	864,049	868,503	872,490	876,430	880,296	883,671	886,582	889,416	892,245	894,788	897,421	899,940	902,132	903,937	905,732	907,455	909,069	910,632
2002	32,565	344,031	525,599	633,613	688,443	720,177	739,891	757,843	769,500	778,621	787,896	800,338	808,006	814,642	820,798	826,998	832,221	836,762	841,053	844,928	848,260	851,600	854,730	857,289	859,563	861,766	863,863	865,968	868,086	869,969
2003	55,128	185,840	324,830	403,828	451,467	480,033	506,247	525,403	541,987	561,485	589,361	603,781	616,769	628,816	640,316	649,595	657,404	665,278	670,394	674,267	678,086	681,463	684,422	687,052	689,696	692,335	694,908	697,467	699,926	702,226
2004	38,686	160,937	242,972	294,888	325,569	354,769	375,841	393,724	415,552	448,548	465,382	480,199	493,726	506,651	517,159	525,966	534,904	540,973	545,664	550,346	554,378	557,774	560,798	563,762	566,809	569,825	572,835	575,725	578,441	580,952
2005	16,239	50,561	81,401	101,242	120,460	134,710	146,911	163,184	188,805	201,254	212,210	222,158	231,365	238,575	244,691	251,097	254,631	257,077	259,532	261,759	263,605	265,278	266,883	268,584	270,338	272,103	273,857	275,638	277,420	279,036
2006	5,616	30,713	57,872	90,659	109,172	123,077	140,906	166,921	179,448	190,044	198,927	206,981	213,136	218,123	223,027	226,478	228,832	231,121	233,215	235,009	236,551	238,007	239,527	241,132	242,722	244,354	245,975	247,640	249,251	250,771
2007	5,801	43,221	90,097	110,984	124,913	142,095	167,393	180,642	191,022	199,612	207,673	213,627	218,299	222,891	226,322	228,958	231,346	233,443	235,160	236,716	238,235	239,748	241,240	242,751	244,377	245,975	247,567	249,149	250,703	252,217
2008	21,625	201,910	283,942	331,155	392,739	477,967	517,627	546,072	569,599	590,879	606,357	618,384	630,210	638,950	645,353	651,044	655,796	659,433	662,738	665,936	669,180	672,441	675,872	679,269	682,818	686,409	690,091	693,711	697,151	700,393
2009	98,063	224,945	325,383	504,747	737,567	831,623	934,374	1,025,898	1,097,848	1,144,902	1,180,361	1,219,377	1,242,336	1,257,718	1,269,946	1,279,386	1,286,922	1,293,338	1,299,403	1,305,600	1,311,893	1,318,514	1,325,116	1,331,640	1,338,420	1,345,163	1,352,033	1,358,972	1,365,731	1,372,050
2010	21,781	81,103	201,673	390,107	491,792	639,501	769,724	870,654	937,172	986,649	1,044,695	1,079,346	1,101,257	1,118,044	1,130,673	1,140,309	1,148,413	1,155,526	1,162,487	1,169,729	1,177,081	1,184,470	1,191,860	1,199,471	1,207,317	1,215,200	1,223,135	1,230,876	1,238,581	1,245,666
2011	4,699	72,890	201,371	282,180	396,897	497,482	575,821	627,939	667,478	714,047	739,576	755,257	767,639	776,989	784,154	789,999	795,226	800,001	804,744	809,822	814,885	819,791	825,133	830,466	835,922	841,521	847,171	852,598	858,081	863,245
2012	8,504	88,475	169,155	295,074	404,847	495,660	558,859	606,929	661,427	684,732	700,079	712,864	722,814	730,484	736,938	742,657	747,907	752,795	757,600	762,608	767,592	772,763	778,084	783,613	789,222	795,077	801,021	807,041	813,136	819,069
2013	12,078	71,424	211,727	343,282	457,884	546,038	615,083	691,687	716,411	732,239	746,602	758,287	767,659	775,344	782,269	788,607	794,755	800,529	806,336	812,116	818,176	824,335	830,748	837,424	844,194	851,297	858,644	866,050	873,257	880,145
2014	10,897	167,653	263,525	335,349	385,250	424,315	467,753	486,748	498,319	508,153	516,333	522,560	527,610	531,909	535,883	539,455	542,701	545,797	548,769	551,848	554,968	558,076	561,332	564,571	568,056	571,513	575,119	578,706	582,242	585,655
2015	32,755	174,953	304,753	402,989	484,315	588,046	625,736	649,041	668,025	682,994	695,583	705,990	715,347	723,550	731,022	737,858	743,853	749,468	755,054	760,774	766,508	772,178	778,241	784,329	790,368	796,929	803,318	809,966	816,617	823,063
2016	34,570	149,409	259,157	369,122	522,401	581,379	619,807	651,290	675,911	695,980	713,403	728,887	742,468	754,602	765,668	775,569	784,485	792,529	800,499	808,487	816,743	825,094	833,619	842,571	851,586	860,897	870,306	879,788	889,089	898,096
2017	21,315	117,658	231,945	424,501	489,113	533,004	571,917	602,628	626,988	647,495	667,106	684,951	700,587	714,836	727,072	738,105	748,059	757,337	766,316	775,468	784,663	793,877	803,400	813,072	823,065	833,017	843,378	853,655	863,740	873,168
2018	14,007	129,830	322,908	394,288	443,628	485,699	518,747	543,618	563,757	581,271	597,479	612,176	624,903	635,956	645,632	654,230	661,953	669,115	676,066	682,872	689,790	696,874	703,993	711,250	718,683	726,266	733,947	741,443	748,857	755,893
2019	40,557	271,351	353,856	411,430	458,352	497,118	527,112	551,276	571,695	589,487	606,117	621,199	633,901	644,893	654,553	663,217	670,844	677,788	684,612	691,394	698,282	705,222	712,202	719,276	726,598	733,777	741,215	748,602	755,701	762,646
2020	52,203	115,888	173,986	229,034	278,096	321,361	358,777	392,315	421,585	448,333	473,547	495,701	515,081	532,408	548,061	562,339	575,543	587,690	599,694	612,035	624,396	637,007	650,034	663,588	677,429	691,328	705,705	720,134	734,186	747,580

Table 9: Cumulative Non-Claim Termination Rate = Table 8 / Table 1 (Evaluation Year 1)
Cumulative Non-Claim Terminations as of Evaluation Year Divided by Active Loans as of Evaluation Year 1

	Evaluation Year																													
Fiscal Year	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	0.34%	2.35%	12.13%	38.35%	56.06%	59.51%	64.14%	67.34%	71.85%	76.10%	77.93%	79.89%	82.28%	84.52%	85.96%	86.85%	87.83%	88.18%	88.43%	88.66%	88.82%	88.99%	89.13%	89.27%	89.42%	89.56%	89.70%	89.85%	90.04%	90.32%
1991	0.29%	5.19%	28.21%	48.91%	52.75%	58.38%	62.34%	68.34%	73.85%	76.05%	78.61%	81.73%	84.70%	86.51%	87.57%	88.55%	88.97%	89.26%	89.51%	89.68%	89.87%	90.02%	90.17%	90.32%	90.47%	90.61%	90.76%	90.92%	91.11%	91.39%
1992	0.64%	9.78%	25.20%	29.92%	37.25%	43.01%	52.78%	62.49%	66.07%	70.70%	76.61%	82.68%	85.76%	87.48%	88.60%	89.28%	89.74%	90.09%	90.37%	90.62%	90.85%	91.09%	91.31%	91.52%	91.74%	91.96%	92.18%	92.41%	92.68%	92.82%
1993	1.54%	8.40%	12.62%	19.48%	25.75%	35.81%	47.13%	52.33%	59.11%	68.10%	79.15%	84.01%	86.60%	88.18%	89.10%	89.74%	90.23%	90.65%	91.01%	91.34%	91.69%	91.98%	92.26%	92.53%	92.79%	93.05%	93.29%	93.55%	93.70%	93.83%
1994	1.01%	4.03%	10.88%	17.08%	27.37%	38.75%	44.34%	51.71%	61.28%	73.81%	79.77%	83.06%	85.01%	86.19%	86.99%	87.59%	88.10%	88.56%	89.00%	89.47%	89.85%	90.18%	90.53%	90.87%	91.20%	91.49%	91.78%	91.98%	92.15%	92.31%
1995	1.41%	8.86%	14.82%	28.00%	41.02%	46.31%	53.84%	63.15%	73.36%	78.83%	82.03%	83.95%	85.13%	85.81%	86.24%	86.60%	86.91%	87.22%	87.53%	87.80%	88.09%	88.35%	88.63%	88.88%	89.12%	89.37%	89.58%	89.80%	90.03%	90.23%
1996	0.48%	3.43%	15.28%	29.43%	35.23%	44.34%	56.04%	69.31%	76.06%	79.95%	82.21%	83.56%	84.36%	84.89%	85.30%	85.65%	85.99%	86.38%	86.70%	87.01%	87.31%	87.61%	87.88%	88.15%	88.41%	88.66%	88.89%	89.15%	89.39%	89.60%
1997	0.59%	9.72%	24.06%	29.79%	39.71%	52.72%	67.37%	74.85%	79.19%	81.67%	83.12%	84.01%	84.58%	85.00%	85.37%	85.73%	86.13%	86.47%	86.80%	87.13%	87.47%	87.77%	88.05%	88.31%	88.59%	88.85%	89.13%	89.39%	89.61%	89.78%
1998	1.16%	7.95%	13.36%	24.15%	40.09%	62.29%	72.86%	78.71%	81.85%	83.67%	84.76%	85.56%	86.13%	86.61%	87.06%	87.61%	88.03%	88.43%	88.82%	89.21%	89.56%	89.86%	90.16%	90.48%	90.77%	91.08%	91.35%	91.58%	91.78%	91.96%
1999	0.73%	3.81%	16.01%	34.23%	57.90%	69.44%	76.01%	79.49%	81.50%	82.71%	83.58%	84.20%	84.72%	85.23%	85.86%	86.31%	86.74%	87.17%	87.59%	87.96%	88.29%	88.61%	88.93%	89.22%	89.53%	89.83%	90.07%	90.26%	90.45%	90.63%
2000	0.61%	24.68%	49.25%	67.42%	75.77%	80.42%	82.90%	84.27%	85.03%	85.53%	85.87%	86.13%	86.39%	86.70%	86.96%	87.21%	87.46%	87.69%	87.91%	88.11%	88.30%	88.49%	88.68%	88.89%	89.09%	89.26%	89.40%	89.54%	89.68%	89.81%
2001	3.17%	20.40%	54.74%	69.22%	76.95%	80.90%	83.09%	84.39%	85.44%	86.10%	86.61%	87.12%	87.78%	88.24%	88.64%	89.04%	89.43%	89.78%	90.07%	90.36%	90.65%	90.91%	91.17%	91.43%	91.65%	91.84%	92.02%	92.19%	92.36%	92.52%
2002	3.42%	36.13%	55.20%	66.54%	72.30%	75.63%	77.70%	79.59%	80.81%	81.77%	82.74%	84.05%	84.85%	85.55%	86.20%	86.85%	87.40%	87.87%	88.33%	88.73%	89.08%	89.43%	89.76%	90.03%	90.27%	90.50%	90.72%	90.94%	91.16%	91.36%
2003	7.02%	23.67%	41.37%	51.43%	57.50%	61.14%	64.47%	66.91%	69.03%	71.51%	75.06%	76.90%	78.55%	80.08%	81.55%	82.73%	83.73%	84.73%	85.38%	85.87%	86.36%	86.79%	87.17%	87.50%	87.84%	88.17%	88.50%	88.83%	89.14%	89.43%
2004	5.46%	22.72%	34.31%	41.64%	45.97%	50.09%	53.07%	55.59%	58.67%	63.33%	65.71%	67.80%	69.71%	71.54%	73.02%	74.26%	75.53%	76.38%	77.05%	77.71%	78.28%	78.76%	79.18%	79.60%	80.03%	80.46%	80.88%	81.29%	81.67%	82.03%
2005	4.11%	12.81%	20.62%	25.64%	30.51%	34.12%	37.21%	41.33%	47.82%	50.98%	53.75%	56.27%	58.61%	60.43%	61.98%	63.60%	64.50%	65.12%	65.74%	66.30%	66.77%	67.20%	67.60%	68.03%	68.48%	68.92%	69.37%	69.82%	70.27%	70.68%
2006	1.50%	8.23%	15.51%	24.29%	29.25%	32.98%	37.76%	44.73%	48.08%	50.92%	53.30%	55.46%	57.11%	58.45%	59.76%	60.69%	61.32%	61.93%	62.49%	62.97%	63.38%	63.77%	64.18%	64.61%	65.04%	65.47%	65.91%	66.36%	66.79%	67.19%
2007	1.51%	11.24%	23.44%	28.87%	32.50%	36.97%	43.55%	47.00%	49.70%	51.93%	54.03%	55.58%	56.79%	57.99%	58.88%	59.57%	60.19%	60.73%	61.18%	61.59%	61.98%	62.37%	62.76%	63.16%	63.58%	63.99%	64.41%	64.82%	65.23%	65.62%
2008	2.22%	20.75%	29.18%	34.03%	40.36%	49.12%	53.19%	56.12%	58.54%	60.72%	62.31%	63.55%	64.76%	65.66%	66.32%	66.91%	67.39%	67.77%	68.11%	68.44%	68.77%	69.10%	69.46%	69.81%	70.17%	70.54%	70.92%	71.29%	71.64%	71.98%
2009	5.92%	13.58%	19.64%	30.47%	44.52%	50.20%	56.40%	61.93%	66.27%	69.11%	71.25%	73.60%	74.99%	75.92%	76.66%	77.23%	77.68%	78.07%	78.43%	78.81%	79.19%	79.59%	79.99%	80.38%	80.79%	81.20%	81.61%	82.03%	82.44%	82.82%
2010	1.44%	5.36%	13.33%	25.79%	32.52%	42.28%	50.89%	57.57%	61.97%	65.24%	69.07%	71.37%	72.81%	73.92%	74.76%	75.40%	75.93%	76.40%	76.86%	77.34%	77.83%	78.32%	78.81%	79.31%	79.83%	80.35%	80.87%	81.39%	81.89%	82.36%
2011	0.45%	6.92%	19.13%	26.81%	37.70%	47.26%	54.70%	59.65%	63.41%	67.83%	70.26%	71.75%	72.93%	73.81%	74.49%	75.05%	75.55%	76.00%	76.45%	76.93%	77.41%	77.88%	78.39%	78.89%	79.41%	79.94%	80.48%	81.00%	81.52%	82.01%
2012	0.81%	8.39%	16.03%	27.97%	38.38%	46.98%	52.97%	57.53%	62.70%	64.91%	66.36%	67.57%	68.52%	69.24%	69.85%	70.40%	70.89%	71.36%	71.81%	72.29%	72.76%	73.25%	73.75%	74.28%	74.81%	75.36%	75.93%	76.50%	77.08%	77.64%
2013	0.96%	5.68%	16.84%	27.31%	36.42%	43.44%	48.93%	55.02%	56.99%	58.25%	59.39%	60.32%	61.06%	61.68%	62.23%	62.73%	63.22%	63.68%	64.14%	64.60%	65.08%	65.57%	66.08%	66.61%	67.15%	67.72%	68.30%	68.89%	69.46%	70.01%
2014	1.50%	23.09%	36.30%	46.19%	53.06%	58.45%	64.43%	67.04%	68.64%	69.99%	71.12%	71.98%	72.67%	73.27%	73.81%	74.30%	74.75%	75.18%	75.59%	76.01%	76.44%	76.87%	77.32%	77.76%	78.24%	78.72%	79.22%	79.71%	80.20%	80.67%
2015	3.15%	16.82%	29.29%	38.73%	46.55%	56.52%	60.14%	62.38%	64.21%	65.65%	66.86%	67.86%	68.76%	69.55%	70.26%	70.92%	71.50%	72.04%	72.57%	73.12%	73.67%	74.22%	74.80%	75.39%	75.97%	76.60%	77.21%	77.85%	78.49%	79.11%
2016	2.91%	12.59%	21.83%	31.09%	44.01%	48.97%	52.21%	54.86%	56.94%	58.63%	60.09%	61.40%	62.54%	63.56%	64.50%	65.33%	66.08%	66.76%	67.43%	68.10%	68.80%	69.50%	70.22%	70.98%	71.73%	72.52%	73.31%	74.11%	74.89%	75.65%
2017	1.79%	9.90%	19.52%	35.72%	41.15%	44.85%	48.12%	50.70%	52.75%	54.48%	56.13%	57.63%	58.95%	60.15%	61.18%	62.10%	62.94%	63.72%	64.48%	65.25%	66.02%	66.80%	67.60%	68.41%	69.25%	70.09%	70.96%	71.83%	72.67%	73.47%
2018	1.44%	13.30%	33.09%	40.40%	45.45%	49.77%	53.15%	55.70%	57.76%	59.56%	61.22%	62.72%	64.03%	65.16%	66.15%	67.03%	67.82%	68.56%	69.27%	69.97%	70.68%	71.40%	72.13%	72.88%	73.64%	74.41%	75.20%	75.97%	76.73%	77.45%
2019	4.36%	29.16%	38.03%	44.22%	49.26%	53.43%	56.65%	59.25%	61.45%	63.36%	65.15%	66.77%	68.13%	69.31%	70.35%	71.28%	72.10%	72.85%	73.58%	74.31%	75.05%	75.80%	76.55%	77.31%	78.09%	78.87%	79.67%	80.46%	81.22%	81.97%
2020	4.21%	9.34%	14.03%	18.47%	22.42%	25.91%	28.93%	31.63%	33.99%	36.15%	38.18%	39.96%	41.53%	42.92%	44.19%	45.34%	46.40%	47.38%	48.35%	49.34%	50.34%	51.36%	52.41%	53.50%	54.62%	55.74%	56.90%	58.06%	59.19%	60.27%

Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Conditional Loss Rate
FRM30

Table 10: Gross Claim Cost in Each Evaluation Year

	Evaluation Year																													
Fiscal Year	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	3,073,174	121,577,290	509,678,668	773,390,685	738,448,353	537,172,034	375,706,244	324,818,786	237,364,165	169,232,305	114,091,398	64,176,679	44,175,715	34,384,165	23,630,775	14,793,867	10,620,098	8,537,081	7,818,831	6,023,987	7,633,326	6,949,939	4,616,051	5,528,983	2,856,656	3,217,871	3,970,355	1,738,932	1,528,767	1,102,182
1991	2,394,083	102,519,986	429,268,515	562,926,254	489,773,748	372,034,291	338,451,613	258,966,731	181,931,080	123,956,954	71,334,262	48,903,602	34,140,473	24,418,397	15,892,943	10,248,505	6,597,679	6,638,314	5,517,185	6,034,513	6,472,318	4,938,751	5,559,679	3,447,390	3,988,209	4,460,169	2,241,865	1,509,856	1,628,291	507,409
1992	1,177,257	67,700,008	243,670,334	320,449,251	313,726,677	333,701,721	288,945,981	222,547,420	152,631,837	92,446,865	61,574,841	39,751,300	26,040,547	15,356,005	10,907,035	6,921,680	6,687,572	5,666,781	5,378,303	6,441,159	4,867,581	5,515,177	3,148,439	4,066,734	4,070,797	3,258,756	1,539,265	1,049,382	498,599	191,915
1993	2,839,718	92,043,966	325,238,304	471,767,764	615,156,734	566,902,676	440,587,971	297,536,938	165,566,183	113,529,563	75,426,923	50,289,064	29,409,551	18,305,054	12,712,257	10,773,291	9,829,444	11,535,915	12,522,402	8,735,522	12,011,671	7,513,181	10,326,163	9,145,330	6,765,726	2,773,363	1,767,759	919,175	939,148	968,031
1994	4,480,635	136,970,098	402,136,551	645,902,878	727,167,625	612,104,430	415,990,256	250,241,729	173,149,002	123,278,738	78,222,093	47,907,219	29,096,287	20,571,489	15,819,236	16,816,263	21,782,789	16,730,524	14,055,716	18,323,195	13,097,966	12,254,236	13,533,898	7,781,462	5,273,476	2,821,699	1,471,134	1,327,042	1,245,838	1,449,958
1995	1,691,029	58,973,972	276,698,219	469,775,507	467,489,891	356,610,248	232,633,573	151,613,076	132,278,968	85,648,840	48,071,874	29,118,006	21,348,922	16,879,027	17,358,471	18,333,881	16,423,904	12,504,077	12,923,983	9,145,365	11,189,472	12,583,862	6,503,498	5,311,990	3,640,849	993,586	1,275,366	1,168,052	861,465	632,490
1996	1,049,471	111,569,840	517,260,192	752,048,643	654,334,149	454,913,411	318,656,666	268,642,446	173,724,023	100,043,751	62,157,369	40,666,914	33,647,776	31,421,899	37,357,956	28,787,215	27,669,569	27,748,526	19,180,557	21,679,071	22,854,470	14,357,901	9,558,701	6,160,061	2,902,929	2,843,306	1,952,259	2,032,663	1,886,837	1,052,522
1997	1,650,692	119,024,450	484,505,733	599,396,116	469,783,175	393,128,231	336,746,911	227,761,417	138,225,292	83,273,750	53,667,450	45,908,866	38,498,550	44,093,936	36,514,659	30,814,908	35,112,682	25,511,880	26,152,094	27,620,054	17,857,750	11,511,295	6,607,753	4,291,789	3,682,619	3,282,258	2,768,608	1,572,108	1,981,688	1,863,076
1998	2,287,005	170,469,053	728,597,516	815,067,326	753,030,923	724,014,042	480,460,751	294,794,569	179,268,478	120,390,763	99,976,668	91,918,495	100,163,144	88,829,625	76,460,757	80,755,846	60,363,506	61,951,588	61,407,906	32,405,505	20,042,397	10,461,735	7,268,032	5,049,348	6,499,002	5,775,571	4,636,541	4,198,384	3,085,927	2,534,687
1999	2,986,126	261,173,509	892,841,790	1,232,218,401	1,363,948,906	946,339,688	565,145,005	325,047,674	211,687,140	177,558,621	159,544,859	169,245,075	160,039,257	135,236,967	134,820,775	93,351,795	94,212,793	92,086,918	50,403,996	36,440,994	19,189,100	10,103,720	9,386,589	10,329,349	10,570,004	7,635,732	6,744,315	5,945,034	3,941,451	2,642,262
2000	3,676,295	248,122,175	1,033,428,521	1,494,354,176	1,060,927,926	594,796,335	339,713,537	225,142,605	182,178,212	148,469,738	159,277,843	126,471,660	104,084,973	105,360,249	75,218,293	76,182,291	70,973,059	43,747,850	34,588,385	17,795,879	10,417,431	6,673,941	8,262,223	7,098,403	6,601,255	5,687,274	4,452,728	3,966,508	2,513,281	2,139,185
2001	1,387,781	318,119,492	1,459,672,872	1,652,674,192	1,137,122,070	692,522,199	452,547,769	370,345,004	311,939,519	341,667,995	297,343,792	244,175,111	237,504,415	155,862,106	155,505,672	131,308,279	81,231,048	48,487,204	27,226,167	15,844,636	13,431,586	14,684,339	12,379,481	9,212,390	9,000,006	7,634,425	6,067,315	5,417,015	3,685,836	2,718,697
2002	2,897,272	379,991,725	1,377,158,118	1,338,967,596	915,336,154	640,426,863	517,552,427	462,586,782	502,867,429	431,270,399	383,764,043	388,663,201	253,230,235	231,461,663	204,856,515	114,084,854	68,663,025	41,374,020	20,439,279	20,061,885	21,358,341	15,691,252	11,796,006	9,679,934	8,559,250	6,582,300	6,653,253	5,262,244	5,046,198	2,795,308
2003	2,691,212	460,790,452	1,050,779,991	915,957,948	740,884,617	699,998,663	680,618,665	809,639,300	691,856,603	666,977,509	692,994,301	475,114,667	373,338,005	302,835,430	160,330,172	89,254,514	49,479,687	23,986,224	30,469,709	26,487,711	22,961,347	17,788,547	12,561,726	13,252,000	10,634,102	10,199,642	9,436,844	7,039,284	6,960,991	3,726,704
2004	61,463,694	648,563,012	947,495,566	997,596,437	1,068,252,252	1,028,346,056	1,173,118,550	971,044,756	966,648,287	1,000,283,906	703,867,316	560,200,596	450,419,273	232,473,115	132,160,101	68,673,728	38,522,300	43,957,401	39,182,980	31,826,061	26,375,962	20,741,302	18,562,275	15,060,445	14,499,704	12,890,148	11,089,532	9,041,403	6,682,573	5,296,616
2005	22,921,065	271,863,229	697,690,875	917,007,413	1,036,435,590	1,153,609,934	981,470,795	941,893,637	992,533,335	703,381,880	553,170,054	434,445,713	230,607,336	125,904,002	75,895,907	34,649,340	41,809,405	32,799,904	24,917,638	21,647,902	15,729,332	15,265,009	11,952,640	11,718,279	10,851,967	9,940,569	8,519,610	6,606,994	5,750,518	3,215,635
2006	9,266,216	289,487,327	951,875,185	1,396,149,381	1,669,959,843	1,295,463,624	1,243,908,059	1,369,987,498	932,179,647	713,043,140	574,462,938	315,405,969	194,939,467	105,620,732	54,941,153	50,930,718	39,955,081	31,136,611	29,019,384	22,528,026	19,015,208	15,148,641	12,061,563	12,248,675	11,593,372	8,483,310	7,257,598	7,017,168	4,103,836	4,483,855
2007	8,600,030	434,692,499	1,494,953,688	2,149,601,164	1,570,536,929	1,749,801,730	2,305,394,148	1,427,122,595	1,009,820,525	829,522,448	485,942,438	268,395,047	163,772,434	90,438,175	65,082,808	65,741,012	51,032,083	38,982,641	31,945,129	26,456,461	20,884,913	18,685,218	16,096,052	15,789,078	14,235,738	13,663,919	8,756,350	8,639,966	5,652,367	4,037,328
2008	20,036,845	1,052,808,154	3,974,752,831	3,839,471,727	4,605,230,662	6,535,304,791	4,122,947,962	2,765,796,438	2,243,658,048	1,257,650,838	695,527,704	426,015,409	234,271,062	193,926,236	170,767,647	123,555,432	99,860,497	76,313,814	66,853,373	56,532,823	47,171,338	35,033,440	35,434,262	28,843,995	26,418,757	22,672,131	19,983,878	15,532,865	12,899,618	9,435,205
2009	32,130,229	1,312,897,432	2,969,467,491	4,345,074,857	6,981,265,083	5,238,445,807	3,693,313,344	2,953,056,771	1,681,948,397	948,432,527	568,624,528	304,105,806	280,154,679	232,040,370	171,420,097	145,511,899	105,358,468	93,331,519	70,048,211	58,699,543	55,081,409	39,101,892	32,506,277	24,753,561	25,436,511	20,060,015	17,685,336	14,226,046	11,512,054	7,443,141
2010	16,396,808	414,170,705	1,301,724,901	2,652,900,868	2,620,321,437	2,188,665,095	1,642,577,290	1,001,205,842	588,876,145	373,934,553	195,585,941	226,892,264	200,926,606	131,484,096	99,169,971	77,547,837	75,310,237	76,298,045	49,325,382	36,455,507	35,120,014	28,094,738	26,502,024	22,091,722	20,549,641	16,353,234	13,837,439	10,941,543	9,283,607	6,360,662
2011	9,597,200	228,456,624	780,519,235	978,205,652	942,536,702	780,828,639	528,378,957	303,874,676	206,083,713	112,485,289	163,684,857	133,760,583	97,455,077	73,238,166	62,624,050	62,477,890	55,840,039	32,582,702	28,477,017	24,842,717	20,603,328	17,889,987	16,160,940	12,602,522	14,883,879	9,807,051	9,300,815	8,563,811	5,907,884	4,096,035
2012	7,813,840	142,209,397	427,841,464	582,333,014	619,311,931	449,086,298	284,961,313	206,914,060	112,617,785	162,952,230	153,796,816	109,423,219	71,733,554	61,600,615	62,562,106	52,434,398	43,041,434	44,563,722	34,747,338	25,650,983	21,725,657	16,220,636	16,986,823	12,840,321	12,904,897	10,927,985	10,079,317	7,961,054	6,057,470	3,745,168
2013	6,443,894	160,040,444	425,136,273	587,069,950	557,645,155	386,969,503	287,520,265	166,701,797	252,185,162	271,496,439	178,604,612	150,163,479	132,031,579	127,895,031	119,223,074	107,184,532	88,993,612	82,689,522	64,350,960	60,760,023	44,954,570	33,772,498	32,269,041	30,472,193	25,689,645	21,917,591	18,609,275	14,881,033	14,299,551	8,583,007
2014	834,183	72,427,343	239,752,157	361,155,252	277,556,496	224,245,247	137,634,974	179,149,911	157,047,388	125,925,134	102,118,433	69,483,264	62,861,610	51,100,563	41,961,996	37,711,426	33,926,686	28,086,900	23,817,722	16,647,053	17,705,692	12,352,263	9,847,808	12,130,667	10,258,857	7,797,664	5,478,598	5,649,211	4,324,940	2,958,914
2015	1,227,990	55,706,687	265,605,537	332,797,566	339,092,897	226,136,663	337,154,417	336,346,608	266,349,199	174,023,902	119,022,326	98,982,327	87,229,959	74,484,281	61,739,616	54,955,437	44,326,588	34,951,681	35,176,208	24,495,897	20,352,287	18,695,937	12,694,806	14,412,462	12,173,004	10,520,993	7,140,977	7,082,886	6,455,808	4,198,506
2016	904,522	59,470,906	234,442,218	363,939,891	288,118,382	575,611,759	532,781,559	413,326,579	335,482,315	221,643,874	181,047,427	155,662,286	122,989,308	122,565,459	89,589,138	79,275,498	65,913,074	61,201,437	41,627,711	36,352,644	26,075,718	24,578,255	19,898,761	16,655,388	16,343,585	14,655,653	11,726,494	9,907,596	8,263,137	6,732,118
2017	1,410,313	57,601,947	258,068,997	312,935,179	803,552,067	1,066,759,605	833,926,919	640,576,065	442,406,039	373,413,370	294,457,421	235,632,550	193,933,126	158,281,037	131,863,254	114,289,052	83,182,712	70,907,749	59,186,816	51,738,968	39,566,031	34,499,309	27,151,871	26,949,419	22,737,187	24,535,729	19,154,731	12,312,652	12,240,896	6,832,001
2018	1,706,489	67,168,719	214,925,094	731,985,738	1,158,195,267	1,045,575,581	877,968,355	709,346,702	554,766,118	487,090,234	370,846,672	282,834,232	225,038,883	176,508,727	151,211,023	116,844,795	95,359,243	73,215,800	65,061,817	70,472,154	47,297,624	38,040,078	30,983,324	30,983,768	28,566,250	23,809,592	21,851,332	20,768,170	14,430,767	9,074,699
2019	1,246,515	34,755,791	583,083,113	1,004,139,121	1,059,477,711	911,133,351	783,868,644	605,062,757	493,910,039	420,409,122	342,863,990	272,989,332	195,964,372	158,022,293	138,410,396	111,883,407	100,995,690	76,987,096	69,181,328	50,049,728	49,945,884	34,412,737	32,337,895	28,273,502	26,428,051	20,196,957	18,421,300	15,834,448	14,543,506	9,394,634
2020	240,882	333,594,405	756,836,358	1,075,773,981	1,259,651,821	1,083,297,967	1,019,347,591	865,717,167	746,227,441	640,141,754	555,800,421	484,093,029	438,814,447	317,534,785	264,236,924	241,880,803	228,846,095	174,537,800	140,674,525	122,293,991	91,516,595	77,988,121	66,014,834	60,136,087	48,999,003	40,289,711	37,862,015	29,767,118	20,303,631	14,056,554

Table 11: Claim Cost Net of Recovery in Each Evaluation Year

	Evaluation Year																													
Fiscal Year	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	2,480,479	65,402,184	251,312,072	381,267,308	374,896,828	275,889,918	199,648,445	163,101,175	105,809,382	76,021,239	48,173,307	25,434,263	18,236,523	13,605,921	9,343,149	6,845,630	5,505,039	5,299,037	5,751,762	4,020,893	5,463,216	4,997,342	3,094,163	3,207,508	1,513,325	1,993,388	2,398,457	754,149	781,067	470,105
1991	958,156	53,248,617	218,568,410	289,878,563	257,872,435	200,545,622	171,832,914	116,787,210	80,851,624	49,565,489	27,463,177	17,193,507	11,687,099	9,127,773	6,567,685	5,023,429	4,252,566	4,922,209	3,638,417	3,995,865	4,286,233	3,146,336	3,207,792	1,958,515	2,392,355	2,345,819	1,282,532	865,923	801,405	303,887
1992	521,537	36,260,058	131,332,599	169,124,776	169,426,858	168,095,579	124,011,074	95,053,542	59,912,812	31,147,076	18,713,522	11,602,782	8,710,484	6,710,693	4,988,613	3,888,999	4,497,065	3,436,670	3,512,234	4,385,151	2,806,725	3,189,454	1,602,331	2,030,533	2,080,459	1,891,993	724,999	263,503	191,641	115,720
1993	1,044,156	51,139,139	179,391,295	252,926,228	294,720,639	234,956,819	172,304,504	105,219,833	48,849,672	31,403,656	22,453,669	15,669,819	10,657,270	8,197,025	6,410,648	6,696,673	6,204,472	6,894,300	7,724,334	5,199,397	6,056,580	3,295,779	5,066,229	5,251,549	3,686,137	1,448,268	968,023	599,094	559,364	530,973
1994	2,504,299	80,319,697	230,016,527	310,059,651	288,879,519	229,645,403	140,017,828	72,044,428	45,921,811	34,026,471	22,161,252	18,339,699	11,806,857	10,780,697	9,770,323	9,331,554	13,429,742	10,425,112	8,676,534	10,359,618	6,133,820	6,587,242	8,073,560	4,016,072	2,096,986	1,963,775	865,990	778,194	755,656	833,948
1995	933,004	35,126,271	125,228,080	178,863,444	175,461,140	126,950,228	72,378,509	45,902,827	42,194,569	27,030,460	17,389,167	11,658,503	11,820,950	10,567,374	10,512,227	11,868,625	10,660,088	7,841,769	7,113,241	5,163,846	6,546,944	6,834,172	3,321,075	2,574,521	2,014,201	680,517	731,316	698,562	555,182	372,395
1996	452,238	44,011,510	191,793,960	277,350,561	220,680,690	139,746,919	92,599,205	84,452,790	53,302,388	35,499,459	25,388,378	20,372,119	20,370,440	19,817,536	23,994,676	19,693,221	17,735,603	15,978,231	9,971,534	12,843,499	13,649,988	8,758,595	5,544,396	4,025,051	1,566,210	1,589,881	1,211,498	1,228,201	1,222,022	665,485
1997	549,156	46,204,814	185,000,677	206,649,243	145,092,681	118,218,900	104,969,353	71,292,048	48,888,423	32,896,847	27,507,512	27,953,373	23,422,632	28,404,194	23,705,122	19,621,540	21,441,877	13,592,557	14,949,830	16,194,182	11,144,195	6,366,288	3,927,071	2,429,170	2,255,804	2,069,121	1,836,612	1,033,334	1,324,891	1,134,355
1998	735,346	67,593,345	248,728,580	242,553,390	209,103,110	218,637,146	144,201,652	98,906,843	69,061,580	61,936,084	59,295,130	56,227,324	64,279,145	58,809,927	50,458,839	49,116,892	33,016,681	35,322,045	39,408,171	22,014,453	11,929,408	6,486,146	4,497,500	3,122,182	4,303,897	3,527,885	3,037,610	2,547,503	1,819,205	1,385,685
1999	1,176,381	97,899,974	286,372,094	350,393,461	410,838,176	291,790,391	200,099,194	123,235,668	103,592,266	105,126,075	94,699,638	105,732,451	107,535,075	87,264,652	81,871,535	54,259,659	55,101,745	56,813,722	33,402,224	24,117,729	12,279,381	7,155,781	5,879,653	6,311,361	6,642,240	4,657,502	4,077,849	3,351,085	2,196,891	1,477,674
2000	1,306,399	86,892,367	325,862,261	503,757,172	358,806,954	219,689,453	141,830,835	113,186,854	111,290,141	92,147,542	105,834,495	87,917,214	71,610,975	67,027,121	45,226,234	49,427,478	47,125,308	29,950,673	23,378,145	11,196,647	7,294,166	4,132,174	5,092,772	4,487,538	4,627,050	3,563,738	2,855,923	2,223,894	1,476,991	1,202,325
2001	427,509	106,203,851	523,469,956	584,028,990	425,435,125	280,394,079	222,688,189	218,030,131	190,261,353	219,768,697	202,713,039	163,329,811	149,805,827	94,985,670	96,724,696	86,675,563	54,563,197	33,300,509	18,369,948	11,252,320	8,231,123	8,699,986	8,004,675	5,829,838	5,259,250	4,681,927	3,507,457	3,283,342	2,111,098	1,442,203
2002	998,154	139,851,836	523,793,885	533,225,365	370,541,854	307,680,488	286,446,061	274,810,328	318,219,490	284,564,833	255,001,276	239,307,348	150,478,044	144,459,085	131,472,876	78,210,416	46,597,486	28,090,152	13,004,356	11,529,222	12,139,335	9,576,950	7,179,223	5,852,323	5,103,559	3,765,281	3,721,003	3,055,547	2,819,461	1,588,253
2003	1,275,139	204,408,081	447,327,819	370,717,427	341,921,289	382,013,037	386,781,855	499,011,758	441,644,126	427,813,257	420,621,192	269,363,691	215,996,609	187,317,240	107,521,130	63,459,189	34,280,309	15,490,172	17,855,223	15,622,663	13,333,038	11,941,184	7,945,156	8,115,148	6,364,064	5,936,653	5,219,148	4,033,336	3,683,295	2,041,670
2004	28,605,580	289,642,825	390,850,693	461,884,436	583,717,738	600,097,396	726,860,154	640,655,901	631,849,740	621,956,046	398,304,084	336,704,298	283,961,425	160,011,057	91,094,396	49,551,146	26,049,418	26,919,703	23,849,040	18,561,280	16,672,885	12,913,334	11,029,765	9,233,348	8,221,219	7,516,122	6,161,526	5,231,119	3,835,537	2,839,041
2005	8,496,331	112,125,597	330,849,206	509,708,383	615,766,284	738,784,405	655,430,888	632,989,376	643,745,354	428,746,034	343,450,536	287,735,631	166,207,593	91,599,349	55,459,747	23,911,930	26,206,430	20,194,607	16,058,246	14,774,473	10,507,237	9,986,396	7,516,256	7,471,139	6,664,124	5,927,091	5,151,229	4,087,750	3,463,170	1,837,152
2006	4,335,720	139,091,415	542,701,421	859,878,146	1,106,467,389	906,454,369	862,679,973	920,551,249	593,595,095	466,656,938	396,247,497	229,466,276	147,093,005	78,485,705	41,436,823	33,396,130	26,593,187	20,385,906	19,202,033	14,444,017	11,921,945	9,650,977	7,676,399	7,344,163	7,166,965	5,084,078	4,347,178	4,132,032	2,468,400	2,657,628
2007	4,918,361	251,460,691	920,569,265	1,449,314,307	1,117,035,079	1,237,451,799	1,552,696,439	916,578,120	663,183,560	575,751,206	349,296,693	202,877,419	125,244,363	69,590,324	44,059,407	44,766,879	33,754,221	26,279,489	20,931,303	17,299,999	13,977,909	12,246,758	10,151,859	9,984,143	8,928,806	8,555,416	5,553,749	5,449,248	3,587,921	2,497,129
2008	11,782,575	651,286,638	2,602,268,295	2,683,426,293	3,185,724,842	4,177,849,298	2,505,226,981	1,721,872,005	1,490,936,848	898,272,862	525,690,155	324,938,328	180,410,397	126,562,257	111,904,278	83,626,083	68,960,177	52,220,355	44,129,982	37,573,622	30,658,468	22,657,736	23,413,652	18,794,209	17,141,255	14,824,129	12,672,917	10,011,359	8,131,259	5,733,942
2009	21,436,645	832,315,256	1,966,040,286	2,845,817,950	4,112,099,999	2,897,068,038	2,132,015,305	1,827,661,565	1,141,383,740	690,379,489	417,205,514	228,397,716	180,644,776	148,559,858	113,071,216	98,121,315	72,593,931	58,354,454	44,243,068	37,162,847	36,825,345	23,520,858	20,821,146	14,878,988	15,258,366	12,770,318	11,270,304	8,916,655	7,051,101	4,394,386
2010	11,096,377	275,878,071	823,771,266	1,454,969,863	1,311,027,559	1,146,784,040	957,829,131	646,906,928	405,456,718	263,949,964	134,428,848	136,650,306	124,261,373	83,190,404	66,599,242	50,729,295	46,972,343	50,573,406	29,914,995	22,388,625	20,779,154	16,853,274	15,893,705	13,057,471	12,316,116	10,080,815	8,064,671	6,603,572	5,502,813	3,588,322
2011	7,060,283	151,849,232	435,634,855	451,040,402	461,147,222	442,553,106	328,484,020	197,896,528	136,344,627	72,409,206	100,791,425	79,763,308	58,787,218	47,533,453	39,538,809	41,181,257	34,848,492	20,634,210	17,104,645	14,852,222	11,913,309	10,373,175	9,474,369	7,220,742	8,358,390	5,460,246	5,233,930	4,803,462	3,249,615	2,222,946
2012	3,944,514	90,403,739	203,673,404	288,709,010	336,277,621	278,249,834	187,997,182	130,624,778	70,016,098	97,470,004	90,994,552	67,645,349	46,622,558	38,346,261	37,753,770	30,835,880	24,589,136	28,553,278	19,338,461	15,083,936	12,642,725	9,895,724	10,092,445	7,578,056	7,647,474	6,486,631	5,880,068	4,770,302	3,452,237	2,110,448
2013	4,094,555	78,733,775	216,271,756	324,725,354	328,600,035	249,748,228	186,292,531	109,599,157	139,762,984	156,590,518	107,530,252	94,351,308	82,490,378	77,604,661	70,472,804	63,060,006	51,752,838	46,089,886	36,472,755	32,958,245	26,051,312	19,839,279	17,869,574	17,587,601	14,641,448	12,528,499	10,523,136	8,267,391	7,565,232	4,494,113
2014	273,515	33,390,206	116,957,420	193,390,851	167,440,758	136,162,196	87,043,101	100,929,309	87,495,695	74,665,711	66,136,379	41,063,024	37,705,955	30,821,371	24,238,188	22,164,992	19,669,604	15,927,724	13,360,736	9,719,371	10,453,982	6,848,862	5,879,679	6,580,386	5,887,811	4,469,023	3,118,416	3,260,718	2,480,058	1,677,063
2015	286,781	29,605,946	141,344,559	194,786,958	205,039,107	145,868,685	192,896,777	190,654,094	164,774,644	108,432,421	73,305,242	59,998,906	51,504,743	44,929,780	36,828,006	31,694,050	25,706,426	20,810,252	20,142,183	13,877,542	12,254,421	10,670,521	7,513,570	8,055,172	6,938,349	6,144,277	4,154,369	3,949,218	3,412,609	2,272,635
2016	495,821	36,478,073	142,748,702	227,693,804	189,141,408	316,013,152	298,790,604	245,463,015	209,779,406	141,637,993	109,144,977	92,459,593	74,038,867	75,141,222	54,150,192	46,647,972	38,355,938	38,530,315	24,342,380	21,326,322	14,860,568	13,971,127	11,874,216	9,790,444	9,488,561	8,685,730	6,916,937	5,792,151	4,817,404	3,602,043
2017	594,813	35,482,761	164,121,224	203,944,984	414,337,655	578,958,792	478,115,600	390,643,692	263,734,148	220,562,243	172,029,530	133,676,275	111,532,810	91,048,481	74,402,938	67,281,727	46,625,127	40,294,431	32,869,999	28,728,382	21,865,708	19,135,225	15,858,280	15,057,368	12,709,876	13,620,757	10,563,559	6,983,229	6,433,650	3,814,211
2018	799,188	45,014,558	143,270,368	376,537,745	651,719,318	599,837,300	530,427,502	410,087,240	319,928,102	283,332,440	220,555,958	162,890,731	129,920,548	99,649,973	88,076,588	65,898,020	53,555,433	42,105,634	36,079,436	42,011,104	26,623,429	22,053,085	18,242,731	16,757,428	15,845,231	13,547,426	12,050,736	11,520,128	7,789,962	4,845,677
2019	839,177	24,642,076	310,333,095	582,809,261	630,473,392	549,075,466	478,790,995	361,107,030	296,640,827	246,089,496	204,342,531	158,363,180	112,992,148	91,749,073	79,817,104	64,231,095	61,861,451	45,677,219	39,806,577	29,383,538	29,084,229	20,854,324	17,740,198	16,628,214	15,495,262	11,725,474	10,319,320	9,215,501	8,381,655	5,250,082
2020	0	196,826,672	441,487,883	659,756,643	796,946,542	678,410,908	636,921,082	519,695,800	449,225,229	385,103,652	327,270,220	289,417,945	265,295,751	188,611,753	155,047,864	140,172,131	141,251,347	102,508,001	82,665,514	71,902,940	54,006,576	45,036,084	38,202,268	36,044,498	29,120,339	23,295,611	21,662,006	17,562,440	11,715,955	7,990,265

Table 12: Conditional Loss Severity = Table 11/Table 10
Loss Severity for Each Evaluation Year

	Evaluation Year																													
Fiscal Year	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	80.71%	53.79%	49.31%	49.30%	50.77%	51.36%	53.14%	50.21%	44.58%	44.92%	42.22%	39.63%	41.28%	39.57%	39.54%	46.27%	51.84%	62.07%	73.56%	66.75%	71.57%	71.90%	67.03%	58.01%	52.98%	61.95%	60.41%	43.37%	51.09%	42.65%
1991	40.02%	51.94%	50.92%	51.49%	52.65%	53.91%	50.77%	45.10%	44.44%	39.99%	38.50%	35.16%	34.23%	37.38%	41.32%	49.02%	64.46%	74.15%	65.95%	66.22%	66.22%	63.71%	57.70%	56.81%	59.99%	52.59%	57.21%	57.35%	49.22%	59.89%
1992	44.30%	53.56%	53.90%	52.78%	54.00%	50.37%	42.92%	42.71%	39.25%	33.69%	30.39%	29.19%	33.45%	43.70%	45.74%	56.19%	67.25%	60.65%	65.30%	68.08%	57.66%	57.83%	50.89%	49.93%	51.11%	58.06%	47.10%	25.11%	38.44%	60.30%
1993	36.77%	55.56%	55.16%	53.61%	47.91%	41.45%	39.11%	35.36%	29.50%	27.66%	29.77%	31.16%	36.24%	44.78%	50.43%	62.16%	63.12%	59.76%	61.68%	59.52%	50.42%	43.87%	49.06%	57.42%	54.48%	52.22%	54.76%	65.18%	59.56%	54.85%
1994	55.89%	58.64%	57.20%	48.00%	39.73%	37.52%	33.66%	28.79%	26.52%	27.60%	28.33%	38.28%	40.58%	52.41%	61.76%	55.49%	61.65%	62.31%	61.73%	56.54%	46.83%	53.75%	59.65%	51.61%	39.76%	69.60%	58.87%	58.64%	60.65%	57.52%
1995	55.17%	59.56%	45.26%	38.07%	37.53%	35.60%	31.11%	30.28%	31.90%	31.56%	36.17%	40.04%	55.37%	62.61%	60.56%	64.74%	64.91%	62.71%	55.04%	56.46%	58.51%	54.31%	51.07%	48.47%	55.32%	68.49%	57.34%	59.81%	64.45%	58.88%
1996	43.09%	39.45%	37.08%	36.88%	33.73%	30.72%	29.06%	31.44%	30.68%	35.48%	40.85%	50.10%	60.54%	63.07%	64.23%	68.41%	64.10%	57.58%	51.99%	59.24%	59.73%	61.00%	58.00%	65.34%	53.95%	55.92%	62.06%	60.42%	64.77%	63.23%
1997	33.27%	38.82%	38.18%	34.48%	30.89%	30.07%	31.17%	31.30%	35.37%	39.50%	51.26%	60.89%	60.84%	64.42%	64.92%	63.68%	61.07%	53.28%	57.16%	58.63%	62.41%	55.30%	59.43%	56.60%	61.26%	63.04%	66.34%	65.73%	66.86%	60.89%
1998	32.15%	39.65%	34.14%	29.76%	27.77%	30.20%	30.01%	33.55%	38.52%	51.45%	59.31%	61.17%	64.17%	66.21%	65.99%	60.82%	54.70%	57.02%	64.17%	67.93%	59.52%	62.00%	61.88%	61.83%	66.22%	61.08%	65.51%	60.68%	58.95%	54.67%
1999	39.39%	37.48%	32.07%	28.44%	30.12%	30.83%	35.41%	37.91%	48.94%	59.21%	59.36%	62.47%	67.19%	64.53%	60.73%	58.12%	58.49%	61.70%	66.27%	66.18%	63.99%	70.82%	62.64%	61.10%	62.84%	61.00%	60.46%	56.37%	55.74%	55.92%
2000	35.54%	35.02%	31.53%	33.71%	33.82%	36.94%	41.75%	50.27%	61.09%	62.06%	66.45%	69.52%	68.80%	63.62%	60.13%	64.88%	66.40%	68.46%	67.59%	62.92%	70.02%	61.92%	61.64%	63.22%	70.09%	62.66%	64.14%	56.07%	58.77%	56.20%
2001	30.81%	33.38%	35.86%	35.34%	37.41%	40.49%	49.21%	58.87%	60.99%	64.32%	68.17%	66.89%	63.07%	60.94%	62.20%	66.01%	67.17%	68.68%	67.47%	71.02%	61.28%	59.25%	64.66%	63.28%	58.44%	61.33%	57.81%	60.61%	57.28%	53.05%
2002	34.45%	36.80%	38.03%	39.82%	40.48%	48.04%	55.35%	59.41%	63.28%	65.98%	66.45%	61.57%	59.42%	62.41%	64.18%	68.55%	67.86%	67.89%	63.62%	57.47%	56.84%	61.03%	60.86%	60.46%	59.63%	57.20%	55.93%	58.07%	55.87%	56.82%
2003	47.38%	44.36%	42.57%	40.47%	46.15%	54.57%	56.83%	61.63%	63.83%	64.14%	60.70%	56.69%	57.86%	61.85%	67.06%	71.10%	69.28%	64.58%	58.60%	58.98%	58.07%	67.13%	63.25%	61.24%	59.85%	58.20%	55.31%	57.30%	52.91%	54.78%
2004	46.54%	44.66%	41.25%	46.30%	54.64%	58.36%	61.96%	65.98%	65.37%	62.18%	56.59%	60.10%	63.04%	68.83%	68.93%	72.15%	67.62%	61.24%	60.87%	58.32%	63.21%	62.26%	59.42%	61.31%	56.70%	58.31%	55.56%	57.86%	57.40%	53.60%
2005	37.07%	41.24%	47.42%	55.58%	59.41%	64.04%	66.78%	67.20%	64.86%	60.95%	62.09%	66.23%	72.07%	72.75%	73.07%	69.01%	62.68%	61.57%	64.45%	68.25%	66.80%	65.42%	62.88%	63.76%	61.41%	59.63%	60.46%	61.87%	60.22%	57.13%
2006	46.79%	48.05%	57.01%	61.59%	66.26%	69.97%	69.35%	67.19%	63.68%	65.45%	68.98%	72.75%	75.46%	74.31%	75.42%	65.57%	66.56%	65.47%	66.17%	64.12%	62.70%	63.71%	63.64%	59.96%	61.82%	59.93%	59.90%	58.88%	60.15%	59.27%
2007	57.19%	57.85%	61.58%	67.42%	71.12%	70.72%	67.35%	64.23%	65.67%	69.41%	71.88%	75.59%	76.47%	76.95%	67.70%	68.10%	66.14%	67.41%	65.52%	65.39%	66.93%	65.54%	63.07%	63.23%	62.72%	62.61%	63.43%	63.07%	63.48%	61.85%
2008	58.80%	61.86%	65.47%	69.89%	69.18%	63.93%	60.76%	62.26%	66.45%	71.42%	75.58%	76.27%	77.01%	65.26%	65.53%	67.68%	69.06%	68.43%	66.01%	66.46%	64.99%	64.67%	66.08%	65.16%	64.88%	65.38%	63.42%	64.45%	63.03%	60.77%
2009	66.72%	63.40%	66.21%	65.50%	58.90%	55.30%	57.73%	61.89%	67.86%	72.79%	73.37%	75.10%	64.48%	64.02%	65.96%	67.43%	68.90%	62.52%	63.16%	63.31%	66.86%	60.15%	64.05%	60.11%	59.99%	63.66%	63.73%	62.68%	61.25%	59.04%
2010	67.67%	66.61%	63.28%	54.84%	50.03%	52.40%	58.31%	64.61%	68.85%	70.59%	68.73%	60.23%	61.84%	63.27%	67.16%	65.42%	62.37%	66.28%	60.65%	61.41%	59.17%	59.99%	59.97%	59.11%	59.93%	61.64%	58.28%	60.35%	59.27%	56.41%
2011	73.57%	66.47%	55.81%	46.11%	48.93%	56.68%	62.17%	65.12%	66.16%	64.37%	61.58%	59.63%	60.32%	64.90%	63.14%	65.91%	62.41%	63.33%	60.06%	59.79%	57.82%	57.98%	58.63%	57.30%	56.16%	55.68%	56.27%	56.09%	55.00%	54.27%
2012	50.48%	63.57%	47.60%	49.58%	54.30%	61.96%	65.97%	63.13%	62.17%	59.82%	59.17%	61.82%	64.99%	62.25%	60.35%	58.81%	57.13%	64.07%	55.65%	58.80%	58.19%	61.01%	59.41%	59.02%	59.26%	59.36%	58.34%	59.92%	56.99%	56.35%
2013	63.54%	49.20%	50.87%	55.31%	58.93%	64.54%	64.79%	65.75%	55.42%	57.68%	60.21%	62.83%	62.48%	60.68%	59.11%	58.83%	58.15%	55.74%	56.68%	54.24%	57.95%	58.74%	55.38%	57.72%	56.99%	57.16%	56.55%	55.56%	52.91%	52.36%
2014	32.79%	46.10%	48.78%	53.55%	60.33%	60.72%	63.24%	56.34%	55.71%	59.29%	64.76%	59.10%	59.98%	60.32%	57.76%	58.78%	57.98%	56.71%	56.10%	58.38%	59.04%	55.45%	59.71%	54.25%	57.39%	57.31%	56.92%	57.72%	57.34%	56.68%
2015	23.35%	53.15%	53.22%	58.53%	60.47%	64.50%	57.21%	56.68%	61.86%	62.31%	61.59%	60.62%	59.04%	60.32%	59.65%	57.67%	57.99%	59.54%	57.26%	56.65%	60.21%	57.07%	59.19%	55.89%	57.00%	58.40%	58.18%	55.76%	52.86%	54.13%
2016	54.82%	61.34%	60.89%	62.56%	65.65%	54.90%	56.08%	59.39%	62.53%	63.90%	60.29%	59.40%	60.20%	61.31%	60.44%	58.84%	58.19%	62.96%	58.48%	58.67%	56.99%	56.84%	59.67%	58.78%	58.06%	59.27%	58.99%	58.46%	58.30%	53.51%
2017	42.18%	61.60%	63.60%	65.17%	51.56%	54.27%	57.33%	60.98%	59.61%	59.07%	58.42%	56.73%	57.51%	57.52%	56.42%	58.87%	56.05%	56.83%	55.54%	55.53%	55.26%	55.47%	58.41%	55.87%	55.90%	55.51%	55.15%	56.72%	52.56%	55.83%
2018	46.83%	67.02%	66.66%	51.44%	56.27%	57.37%	60.42%	57.81%	57.67%	58.17%	59.47%	57.59%	57.73%	56.46%	58.25%	56.40%	56.16%	57.51%	55.45%	59.61%	56.29%	57.97%	58.88%	54.08%	55.47%	56.90%	55.15%	55.47%	53.98%	53.40%
2019	67.32%	70.90%	53.22%	58.04%	59.51%	60.26%	61.08%	59.68%	60.06%	58.54%	59.60%	58.01%	57.66%	58.06%	57.67%	57.41%	61.25%	59.33%	57.54%	58.71%	58.23%	60.60%	54.86%	58.81%	58.63%	58.06%	56.02%	58.20%	57.63%	55.88%
2020	0.00%	59.00%	58.33%	61.33%	63.27%	62.62%	62.48%	60.03%	60.20%	60.16%	58.88%	59.79%	60.46%	59.40%	58.68%	57.95%	61.72%	58.73%	58.76%	58.80%	59.01%	57.75%	57.87%	59.94%	59.43%	57.82%	57.21%	59.00%	57.70%	56.84%

Appendix G
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Mutual Mortgage Insurance Fund
Forward Mortgage Summaries
Cumulative Loss Rate
FRM30

Table 13: Cumulative Gross Claim Cost
Total Gross Losses for each Fiscal Year as of the End of the Evaluation Year

Evaluation Year (1–15)

Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1990	3,073,174	124,650,464	634,329,132	1,407,719,817	2,146,168,170	2,683,340,204	3,059,046,448	3,383,865,234	3,621,229,399	3,790,461,704	3,904,553,102	3,968,729,781	4,012,905,496	4,047,289,661	4,070,920,436
1991	2,394,083	104,914,069	534,182,584	1,097,108,838	1,586,882,586	1,958,916,877	2,297,368,490	2,556,335,221	2,738,266,301	2,862,223,255	2,933,557,517	2,982,461,119	3,016,601,592	3,041,019,989	3,056,912,932
1992	1,177,257	68,877,265	312,547,599	632,996,850	946,723,527	1,280,425,248	1,569,371,229	1,791,918,649	1,944,550,486	2,036,997,351	2,098,572,192	2,138,323,492	2,164,364,039	2,179,720,044	2,190,627,079
1993	2,839,718	94,883,684	420,121,988	891,889,752	1,507,046,486	2,073,949,162	2,514,537,133	2,812,074,071	2,977,640,254	3,091,169,817	3,166,596,740	3,216,885,804	3,246,295,355	3,264,600,409	3,277,312,666
1994	4,480,635	141,450,733	543,587,284	1,189,490,162	1,916,657,787	2,528,762,217	2,944,752,473	3,194,994,202	3,368,143,204	3,491,421,942	3,569,644,035	3,617,551,254	3,646,647,541	3,667,219,030	3,683,038,266
1995	1,691,029	60,665,001	337,363,220	807,138,727	1,274,628,618	1,631,238,866	1,863,872,439	2,015,485,515	2,147,764,483	2,233,413,323	2,281,485,197	2,310,603,203	2,331,952,125	2,348,831,152	2,366,189,623
1996	1,049,471	112,619,311	629,879,503	1,381,928,146	2,036,262,295	2,491,175,706	2,809,832,372	3,078,474,818	3,252,198,841	3,352,242,592	3,414,399,961	3,455,066,875	3,488,714,651	3,520,136,550	3,557,494,506
1997	1,650,692	120,675,142	605,180,875	1,204,576,991	1,674,360,166	2,067,488,397	2,404,235,308	2,631,996,725	2,770,222,017	2,853,495,767	2,907,163,217	2,953,072,083	2,991,570,633	3,035,664,569	3,072,179,228
1998	2,287,005	172,756,058	901,353,574	1,716,420,900	2,469,451,823	3,193,465,865	3,673,926,616	3,968,721,185	4,147,989,663	4,268,380,426	4,368,357,094	4,460,275,589	4,560,438,733	4,649,268,358	4,725,729,115
1999	2,986,126	264,159,635	1,157,001,425	2,389,219,826	3,753,168,732	4,699,508,420	5,264,653,425	5,589,701,099	5,801,388,239	5,978,946,860	6,138,491,719	6,307,736,794	6,467,776,051	6,603,013,018	6,737,833,793
2000	3,676,295	251,798,470	1,285,226,991	2,779,581,167	3,840,509,093	4,435,305,428	4,775,018,965	5,000,161,570	5,182,339,782	5,330,809,520	5,490,087,363	5,616,559,023	5,720,643,996	5,826,004,245	5,901,222,538
2001	1,387,781	319,507,273	1,779,180,145	3,431,854,337	4,568,976,407	5,261,498,606	5,714,046,375	6,084,391,379	6,396,330,898	6,737,998,893	7,035,342,685	7,279,517,796	7,517,022,211	7,672,884,317	7,828,389,989
2002	2,897,272	382,888,997	1,760,047,115	3,099,014,711	4,014,350,865	4,654,777,728	5,172,330,155	5,634,916,937	6,137,784,366	6,569,054,765	6,952,818,808	7,341,482,009	7,594,712,244	7,826,173,907	8,031,030,422
2003	2,691,212	463,481,664	1,514,261,655	2,430,219,603	3,171,104,220	3,871,102,883	4,551,721,548	5,361,360,848	6,053,217,451	6,720,194,960	7,413,189,261	7,888,303,928	8,261,641,933	8,564,477,363	8,724,807,535
2004	61,463,694	710,026,706	1,657,522,272	2,655,118,709	3,723,370,961	4,751,717,017	5,924,835,567	6,895,880,323	7,862,528,610	8,862,812,516	9,566,679,832	10,126,880,428	10,577,299,701	10,809,772,816	10,941,932,917
2005	22,921,065	294,784,294	992,475,169	1,909,482,582	2,945,918,172	4,099,528,106	5,080,998,901	6,022,892,538	7,015,425,873	7,718,807,753	8,271,977,807	8,706,423,520	8,937,030,856	9,062,934,858	9,138,830,765
2006	9,266,216	298,753,543	1,250,628,728	2,646,778,109	4,316,737,952	5,612,201,576	6,856,109,635	8,226,097,133	9,158,276,780	9,871,319,920	10,445,782,858	10,761,188,827	10,956,128,294	11,061,749,026	11,116,690,179
2007	8,600,030	443,292,529	1,938,246,217	4,087,847,381	5,658,384,310	7,408,186,040	9,713,580,188	11,140,702,783	12,150,523,308	12,980,045,756	13,465,988,194	13,734,383,241	13,898,155,675	13,988,593,850	14,053,676,658
2008	20,036,845	1,072,844,999	5,047,597,830	8,887,069,557	13,492,300,219	20,027,605,010	24,150,552,972	26,916,349,410	29,160,007,458	30,417,658,296	31,113,186,000	31,539,201,409	31,773,472,471	31,967,398,707	32,138,166,353
2009	32,130,229	1,345,027,661	4,314,495,152	8,659,570,009	15,640,835,092	20,879,280,899	24,572,594,243	27,525,651,014	29,207,599,411	30,156,031,938	30,724,656,466	31,028,762,272	31,308,916,951	31,540,957,321	31,712,377,418
2010	16,396,808	430,567,513	1,732,292,414	4,385,193,282	7,005,514,719	9,194,179,814	10,836,757,104	11,837,962,946	12,426,839,091	12,800,773,644	12,996,359,585	13,223,251,849	13,424,178,455	13,555,662,551	13,654,832,522
2011	9,597,200	238,053,824	1,018,573,059	1,996,778,711	2,939,315,413	3,720,144,052	4,248,523,009	4,552,397,685	4,758,481,398	4,870,966,687	5,034,651,544	5,168,412,127	5,265,867,204	5,339,105,370	5,401,729,420
2012	7,813,840	150,023,237	577,864,701	1,160,197,715	1,779,509,646	2,228,595,944	2,513,557,257	2,720,471,317	2,833,089,102	2,996,041,332	3,149,838,148	3,259,261,367	3,330,994,921	3,392,595,536	3,455,157,643
2013	6,443,894	166,484,338	591,620,611	1,178,690,561	1,736,335,716	2,123,305,219	2,410,825,484	2,577,527,281	2,829,712,443	3,101,208,882	3,279,813,494	3,429,976,973	3,562,008,552	3,689,903,583	3,809,126,657
2014	834,183	73,261,526	313,013,683	674,168,935	951,725,431	1,175,970,678	1,313,605,652	1,492,755,563	1,649,802,951	1,775,728,085	1,877,846,518	1,947,329,782	2,010,191,392	2,061,291,954	2,103,253,950
2015	1,227,990	56,934,677	322,540,214	655,337,780	994,430,677	1,220,567,340	1,557,721,757	1,894,068,365	2,160,417,563	2,334,441,466	2,453,463,791	2,552,446,118	2,639,676,077	2,714,160,358	2,775,899,974
2016	904,522	60,375,428	294,817,646	658,757,537	946,875,919	1,522,487,678	2,055,269,237	2,468,595,816	2,804,078,131	3,025,722,005	3,206,769,432	3,362,431,719	3,485,421,027	3,607,986,486	3,697,575,624
2017	1,410,313	59,012,260	317,081,257	630,016,436	1,433,568,503	2,500,328,108	3,334,255,027	3,974,831,092	4,417,237,131	4,790,650,501	5,085,107,922	5,320,740,472	5,514,673,598	5,672,954,635	5,804,817,889
2018	1,706,489	68,875,208	283,800,302	1,015,786,040	2,173,981,306	3,219,556,887	4,097,525,242	4,806,871,944	5,361,638,062	5,848,728,296	6,219,574,968	6,502,409,200	6,727,448,082	6,903,956,809	7,055,167,833
2019	1,246,515	36,002,306	619,085,419	1,623,224,540	2,682,702,251	3,593,835,601	4,377,704,245	4,982,767,002	5,476,677,041	5,897,086,163	6,239,950,153	6,512,939,485	6,708,903,857	6,866,926,150	7,005,336,546
2020	240,882	333,835,287	1,090,671,645	2,166,445,626	3,426,097,447	4,509,395,414	5,528,743,005	6,394,460,172	7,140,687,613	7,780,829,367	8,336,629,789	8,820,722,818	9,259,537,265	9,577,072,050	9,841,308,974

Evaluation Year (16–30)

Fiscal Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1990	4,085,714,303	4,096,334,401	4,104,871,482	4,112,690,313	4,118,714,300	4,126,347,626	4,133,297,565	4,137,913,616	4,143,442,599	4,146,299,255	4,149,517,126	4,153,487,481	4,155,226,413	4,156,755,180	4,157,857,362
1991	3,067,161,437	3,073,759,116	3,080,397,430	3,085,914,615	3,091,949,128	3,098,421,446	3,103,360,197	3,108,919,876	3,112,367,266	3,116,355,475	3,120,815,644	3,123,057,509	3,124,567,365	3,126,195,656	3,126,703,065
1992	2,197,548,759	2,204,236,331	2,209,903,112	2,215,281,415	2,221,722,574	2,226,590,155	2,232,105,332	2,235,253,771	2,239,320,505	2,243,391,302	2,246,650,058	2,248,189,323	2,249,238,705	2,249,737,304	2,249,929,219
1993	3,288,085,957	3,297,915,401	3,309,451,316	3,321,973,718	3,330,709,240	3,342,720,911	3,350,234,092	3,360,560,255	3,369,705,585	3,376,471,311	3,379,244,674	3,381,012,433	3,381,931,608	3,382,870,756	3,383,838,787
1994	3,699,854,529	3,721,637,318	3,738,367,842	3,752,423,558	3,770,746,753	3,783,844,719	3,796,098,955	3,809,632,853	3,817,414,315	3,822,687,791	3,825,509,490	3,826,980,624	3,828,307,666	3,829,553,505	3,831,003,462
1995	2,384,523,504	2,400,947,408	2,413,451,485	2,426,375,468	2,435,520,833	2,446,710,305	2,459,294,167	2,465,797,665	2,471,109,655	2,474,750,504	2,475,744,090	2,477,019,456	2,478,187,507	2,479,048,973	2,479,681,463
1996	3,586,281,721	3,613,951,290	3,641,699,816	3,660,880,373	3,682,559,444	3,705,413,914	3,719,771,815	3,729,330,516	3,735,490,577	3,738,393,506	3,741,236,812	3,743,189,071	3,745,221,734	3,747,108,571	3,748,161,094
1997	3,102,994,136	3,138,106,818	3,163,618,698	3,189,770,792	3,217,390,846	3,235,248,596	3,246,759,891	3,253,367,644	3,257,659,433	3,261,342,052	3,264,624,311	3,267,392,919	3,268,965,027	3,270,946,715	3,272,809,791
1998	4,806,484,961	4,866,848,467	4,928,800,055	4,990,207,961	5,022,613,466	5,042,655,863	5,053,117,598	5,060,385,630	5,065,434,978	5,071,933,980	5,077,709,551	5,082,346,092	5,086,544,477	5,089,630,404	5,092,165,091
1999	6,831,185,588	6,925,398,381	7,017,485,299	7,067,889,295	7,104,330,289	7,123,519,389	7,133,623,109	7,143,009,698	7,153,339,047	7,163,909,051	7,171,544,783	7,178,289,098	7,184,234,132	7,188,175,583	7,190,817,845
2000	5,977,404,829	6,048,377,888	6,092,125,738	6,126,714,123	6,144,510,002	6,154,927,433	6,161,601,374	6,169,863,596	6,176,962,000	6,183,563,255	6,189,250,528	6,193,703,256	6,197,669,764	6,200,183,045	6,202,322,230
2001	7,959,698,268	8,040,929,316	8,089,416,520	8,116,642,687	8,132,487,323	8,145,918,909	8,160,603,249	8,172,982,730	8,182,195,120	8,191,195,126	8,198,829,551	8,204,896,866	8,210,313,881	8,213,999,717	8,216,718,414
2002	8,145,115,276	8,213,778,301	8,255,152,321	8,275,591,600	8,295,653,485	8,317,011,826	8,332,703,078	8,344,499,084	8,354,179,018	8,362,738,268	8,369,320,568	8,375,973,821	8,381,236,065	8,386,282,263	8,389,077,571
2003	8,814,062,049	8,863,541,736	8,887,527,960	8,917,997,669	8,944,485,380	8,967,446,727	8,985,235,274	8,997,797,000	9,011,049,000	9,021,683,102	9,031,882,744	9,041,319,587	9,048,358,871	9,055,319,862	9,059,046,566
2004	11,010,606,645	11,049,128,945	11,093,086,346	11,132,269,326	11,164,095,386	11,190,471,348	11,211,212,650	11,229,774,925	11,244,835,370	11,259,335,074	11,272,225,222	11,283,314,754	11,292,356,157	11,299,038,730	11,304,335,347
2005	9,173,480,105	9,215,289,510	9,248,089,414	9,273,007,052	9,294,654,954	9,310,384,285	9,325,649,294	9,337,601,935	9,349,320,214	9,360,172,181	9,370,112,750	9,378,632,360	9,385,239,354	9,390,989,872	9,394,205,507
2006	11,167,620,897	11,207,575,978	11,238,712,589	11,267,731,973	11,290,259,999	11,309,275,207	11,324,423,848	11,336,485,411	11,348,734,086	11,360,327,458	11,368,810,768	11,376,068,365	11,383,085,533	11,387,189,369	11,391,673,225
2007	14,119,417,670	14,170,449,753	14,209,432,393	14,241,377,522	14,267,833,983	14,288,718,896	14,307,404,114	14,323,500,166	14,339,289,244	14,353,524,982	14,367,188,901	14,375,945,251	14,384,585,217	14,390,237,584	14,394,274,912
2008	32,261,721,785	32,361,582,282	32,437,896,096	32,504,749,469	32,561,282,292	32,608,453,630	32,643,487,070	32,678,921,332	32,707,765,327	32,734,184,084	32,756,856,215	32,776,840,093	32,792,372,958	32,805,272,576	32,814,707,781
2009	31,857,889,317	31,963,247,785	32,056,579,304	32,126,627,515	32,185,327,058	32,240,408,466	32,279,510,359	32,312,016,636	32,336,770,197	32,362,206,708	32,382,266,724	32,399,952,060	32,414,178,106	32,425,690,160	32,433,133,301
2010	13,732,380,359	13,807,690,595	13,883,988,640	13,933,314,022	13,969,769,529	14,004,889,543	14,032,984,281	14,059,486,305	14,081,578,027	14,102,127,668	14,118,480,902	14,132,318,340	14,143,259,883	14,152,543,490	14,158,904,152
2011	5,464,207,310	5,520,047,349	5,552,630,051	5,581,107,068	5,605,949,785	5,626,553,113	5,644,443,100	5,660,604,040	5,673,206,561	5,688,090,440	5,697,897,491	5,707,198,306	5,715,762,117	5,721,670,001	5,725,766,036
2012	3,507,592,040	3,550,633,474	3,595,197,197	3,629,944,534	3,655,595,518	3,677,321,175	3,693,541,811	3,710,528,634	3,723,368,955	3,736,273,851	3,747,201,837	3,757,281,154	3,765,242,208	3,771,299,678	3,775,044,847
2013	3,916,311,189	4,005,304,801	4,087,994,323	4,152,345,283	4,213,105,307	4,258,059,876	4,291,832,374	4,324,101,416	4,354,573,609	4,380,263,254	4,402,180,845	4,420,790,120	4,435,671,153	4,449,970,704	4,458,553,711
2014	2,140,965,376	2,174,892,062	2,202,978,962	2,226,796,685	2,243,443,737	2,261,149,429	2,273,501,692	2,283,349,500	2,295,480,167	2,305,739,025	2,313,536,688	2,319,015,287	2,324,664,498	2,328,989,438	2,331,948,352
2015	2,830,855,411	2,875,181,999	2,910,133,680	2,945,309,888	2,969,805,785	2,990,158,072	3,008,854,009	3,021,548,816	3,035,961,278	3,048,134,283	3,058,655,275	3,065,796,252	3,072,879,138	3,079,334,946	3,083,533,452
2016	3,776,851,122	3,842,764,196	3,903,965,632	3,945,593,344	3,981,945,988	4,008,021,706	4,032,599,960	4,052,498,721	4,069,154,109	4,085,497,694	4,100,153,347	4,111,879,841	4,121,787,437	4,130,050,574	4,136,782,692
2017	5,919,106,940	6,002,289,652	6,073,197,401	6,132,384,217	6,184,123,186	6,223,689,217	6,258,188,526	6,285,340,397	6,312,289,816	6,335,027,003	6,359,562,732	6,378,717,463	6,391,030,115	6,403,271,010	6,410,103,012
2018	7,172,012,628	7,267,371,871	7,340,587,672	7,405,649,488	7,476,121,643	7,523,419,266	7,561,459,345	7,592,442,668	7,623,426,436	7,651,992,686	7,675,802,278	7,697,653,610	7,718,421,781	7,732,852,548	7,741,927,246
2019	7,117,219,953	7,218,215,643	7,295,202,739	7,364,384,066	7,414,433,794	7,464,379,678	7,498,792,415	7,531,130,310	7,559,403,811	7,585,831,862	7,606,028,819	7,624,450,119	7,640,284,568	7,654,828,074	7,664,222,708
2020	10,083,189,776	10,312,035,871	10,486,573,671	10,627,248,196	10,749,542,187	10,841,058,782	10,919,046,903	10,985,061,737	11,045,197,825	11,094,196,828	11,134,486,539	11,172,348,554	11,202,115,672	11,222,419,303	11,236,475,858

Table 14: Cumulative Claim Cost Net of Recovery
Total Losses Net of Recovery for each Fiscal Year as of the End of the Evaluation Year

Evaluation Year (1–15)

Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1990	2,480,479	67,882,664	319,194,735	700,462,043	1,075,358,871	1,351,248,789	1,550,897,234	1,713,998,408	1,819,807,790	1,895,829,029	1,944,002,336	1,969,436,599	1,987,673,122	2,001,279,042	2,010,622,191
1991	958,156	54,206,774	272,775,183	562,653,746	820,526,181	1,021,071,803	1,192,904,717	1,309,691,927	1,390,543,551	1,440,109,040	1,467,572,217	1,484,765,724	1,496,452,824	1,505,580,597	1,512,148,282
1992	521,537	36,781,595	168,114,194	337,238,970	506,665,828	674,761,407	798,772,481	893,826,023	953,738,835	984,885,911	1,003,599,433	1,015,202,216	1,023,912,700	1,030,623,393	1,035,612,006
1993	1,044,156	52,183,295	231,574,590	484,500,818	779,221,456	1,014,178,276	1,186,482,780	1,291,702,613	1,340,552,285	1,371,955,941	1,394,409,610	1,410,079,429	1,420,736,699	1,428,933,724	1,435,344,372
1994	2,504,299	82,823,996	312,840,523	622,900,174	911,779,693	1,141,425,096	1,281,442,924	1,353,487,352	1,399,409,163	1,433,435,634	1,455,596,886	1,473,936,585	1,485,743,442	1,496,524,139	1,506,294,462
1995	933,004	36,059,275	161,287,355	340,150,799	515,611,939	642,562,167	714,940,676	760,843,504	803,038,072	830,068,532	847,457,700	859,116,203	870,937,153	881,504,527	892,016,754
1996	452,238	44,463,748	236,257,708	513,608,269	734,288,959	874,035,878	966,635,083	1,051,087,874	1,104,390,262	1,139,889,721	1,165,278,098	1,185,650,218	1,206,020,658	1,225,838,194	1,249,832,870
1997	549,156	46,753,970	231,754,646	438,403,889	583,496,570	701,715,470	806,684,824	877,976,871	926,865,294	959,762,141	987,269,653	1,015,223,026	1,038,645,658	1,067,049,852	1,090,754,974
1998	735,346	68,328,691	317,057,271	559,610,661	768,713,771	987,350,917	1,131,552,569	1,230,459,412	1,299,520,992	1,361,457,076	1,420,752,206	1,476,979,530	1,541,258,675	1,600,068,602	1,650,527,440
1999	1,176,381	99,076,355	385,448,448	735,841,909	1,146,680,085	1,438,470,476	1,638,569,670	1,761,805,338	1,865,397,604	1,970,523,679	2,065,223,317	2,170,955,767	2,278,490,842	2,365,755,495	2,447,627,029
2000	1,306,399	88,198,766	414,061,027	917,818,199	1,276,625,153	1,496,314,606	1,638,145,442	1,751,332,295	1,862,622,437	1,954,769,979	2,060,604,474	2,148,521,687	2,220,132,662	2,287,159,784	2,332,386,018
2001	427,509	106,631,360	630,101,316	1,214,130,306	1,639,565,431	1,919,959,510	2,142,647,699	2,360,677,831	2,550,939,184	2,770,707,881	2,973,420,920	3,136,750,732	3,286,556,559	3,381,542,228	3,478,266,925
2002	998,154	140,849,991	664,643,876	1,197,869,241	1,568,411,094	1,876,091,583	2,162,537,644	2,437,347,972	2,755,567,462	3,040,132,294	3,295,133,571	3,534,440,918	3,684,918,963	3,829,378,048	3,960,850,924
2003	1,275,139	205,683,220	653,011,039	1,023,728,465	1,365,649,754	1,747,662,792	2,134,444,646	2,633,456,404	3,075,100,529	3,502,913,786	3,923,534,978	4,192,898,670	4,408,895,279	4,596,212,519	4,703,733,649
2004	28,605,580	318,248,405	709,099,098	1,170,983,533	1,754,701,272	2,354,798,668	3,081,658,822	3,722,314,722	4,354,164,463	4,976,120,509	5,374,424,592	5,711,128,890	5,995,090,316	6,155,101,372	6,246,195,768
2005	8,496,331	120,621,928	451,471,135	961,179,518	1,576,945,801	2,315,730,206	2,971,161,094	3,604,150,471	4,247,895,824	4,676,641,859	5,020,092,395	5,307,828,026	5,474,035,619	5,565,634,968	5,621,094,714
2006	4,335,720	143,427,135	686,128,556	1,546,006,702	2,652,474,091	3,558,928,460	4,421,608,433	5,342,159,682	5,935,754,777	6,402,411,714	6,798,659,211	7,028,125,488	7,175,218,493	7,253,704,198	7,295,141,020
2007	4,918,361	256,379,052	1,176,948,317	2,626,262,624	3,743,297,703	4,980,749,501	6,533,445,940	7,450,024,059	8,113,207,619	8,688,958,825	9,038,255,518	9,241,132,937	9,366,377,300	9,435,967,623	9,480,027,030
2008	11,782,575	663,069,213	3,265,337,508	5,948,763,801	9,134,488,644	13,312,337,941	15,817,564,923	17,539,436,928	19,030,373,775	19,928,646,637	20,454,336,791	20,779,275,120	20,959,685,517	21,086,247,774	21,198,152,052
2009	21,436,645	853,751,900	2,819,792,186	5,665,610,137	9,777,710,135	12,674,778,173	14,806,793,479	16,634,455,044	17,775,838,784	18,466,218,273	18,883,423,786	19,111,821,503	19,292,466,279	19,441,026,137	19,554,097,353
2010	11,096,377	286,974,448	1,110,745,714	2,565,715,577	3,876,743,136	5,023,527,176	5,981,356,307	6,628,263,236	7,033,719,953	7,297,669,917	7,432,098,765	7,568,749,071	7,693,010,444	7,776,200,848	7,842,800,091
2011	7,060,283	158,909,515	594,544,370	1,045,584,772	1,506,731,994	1,949,285,100	2,277,769,120	2,475,665,647	2,612,010,274	2,684,419,480	2,785,210,906	2,864,974,213	2,923,761,432	2,971,294,885	3,010,833,694
2012	3,944,514	94,348,253	298,021,657	586,730,667	923,008,287	1,201,258,121	1,389,255,303	1,519,880,082	1,589,896,180	1,687,366,184	1,778,360,735	1,846,006,084	1,892,628,642	1,930,974,904	1,968,728,674
2013	4,094,555	82,828,330	299,100,087	623,825,441	952,425,476	1,202,173,704	1,388,466,235	1,498,065,392	1,637,828,376	1,794,418,894	1,901,949,146	1,996,300,455	2,078,790,832	2,156,395,494	2,226,868,297
2014	273,515	33,663,721	150,621,141	344,011,993	511,452,751	647,614,946	734,658,047	835,587,356	923,083,050	997,748,761	1,063,885,140	1,104,948,164	1,142,654,119	1,173,475,490	1,197,713,678
2015	286,781	29,892,728	171,237,287	366,024,244	571,063,351	716,932,036	909,828,813	1,100,482,907	1,265,257,552	1,373,689,973	1,446,995,215	1,506,994,120	1,558,498,864	1,603,428,644	1,640,256,650
2016	495,821	36,973,894	179,722,596	407,416,401	596,557,808	912,570,961	1,211,361,565	1,456,824,580	1,666,603,986	1,808,241,979	1,917,386,956	2,009,846,549	2,083,885,415	2,159,026,638	2,213,176,830
2017	594,813	36,077,574	200,198,798	404,143,782	818,481,437	1,397,440,229	1,875,555,829	2,266,199,521	2,529,933,669	2,750,495,912	2,922,525,442	3,056,201,717	3,167,734,527	3,258,783,008	3,333,185,946
2018	799,188	45,813,747	189,084,115	565,621,861	1,217,341,178	1,817,178,478	2,347,605,980	2,757,693,220	3,077,621,322	3,360,953,762	3,581,509,720	3,744,400,451	3,874,320,999	3,973,970,972	4,062,047,560
2019	839,177	25,481,253	335,814,347	918,623,609	1,549,097,000	2,098,172,466	2,576,963,461	2,938,070,492	3,234,711,319	3,480,800,815	3,685,143,347	3,843,506,526	3,956,498,674	4,048,247,747	4,128,064,851
2020	0	196,826,672	638,314,555	1,298,071,198	2,095,017,740	2,773,428,648	3,410,349,731	3,930,045,530	4,379,270,760	4,764,374,412	5,091,644,632	5,381,062,577	5,646,358,328	5,834,970,081	5,990,017,944

Evaluation Year (16–30)

Fiscal Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1990	2,017,467,822	2,022,972,860	2,028,271,897	2,034,023,659	2,038,044,551	2,043,507,767	2,048,505,109	2,051,599,271	2,054,806,779	2,056,320,104	2,058,313,493	2,060,711,950	2,061,466,099	2,062,247,165	2,062,717,271
1991	1,517,171,711	1,521,424,277	1,526,346,486	1,529,984,903	1,533,980,768	1,538,267,000	1,541,413,336	1,544,621,129	1,546,579,643	1,548,971,998	1,551,317,817	1,552,600,349	1,553,466,272	1,554,267,677	1,554,571,565
1992	1,039,501,005	1,043,998,070	1,047,434,740	1,050,946,974	1,055,332,125	1,058,138,850	1,061,328,303	1,062,930,634	1,064,961,168	1,067,041,627	1,068,933,620	1,069,658,619	1,069,922,122	1,070,113,763	1,070,229,483
1993	1,442,041,045	1,448,245,517	1,455,139,817	1,462,864,150	1,468,063,548	1,474,120,128	1,477,415,907	1,482,482,136	1,487,733,685	1,491,419,822	1,492,868,090	1,493,836,113	1,494,435,206	1,494,994,570	1,495,525,544
1994	1,515,626,016	1,529,055,758	1,539,480,869	1,548,157,404	1,558,517,022	1,564,650,842	1,571,238,084	1,579,311,645	1,583,327,717	1,585,424,703	1,587,388,477	1,588,254,468	1,589,032,662	1,589,788,317	1,590,622,265
1995	903,885,378	914,545,467	922,387,236	929,500,476	934,664,322	941,211,267	948,045,439	951,366,513	953,941,035	955,955,236	956,635,753	957,367,070	958,065,632	958,620,814	958,993,209
1996	1,269,526,091	1,287,261,694	1,303,239,924	1,313,211,458	1,326,054,957	1,339,704,945	1,348,463,540	1,354,007,936	1,358,032,987	1,359,599,197	1,361,189,077	1,362,400,575	1,363,628,776	1,364,850,799	1,365,516,283
1997	1,110,376,514	1,131,818,391	1,145,410,947	1,160,360,777	1,176,554,959	1,187,699,153	1,194,065,442	1,197,992,513	1,200,421,683	1,202,677,486	1,204,746,607	1,206,583,219	1,207,616,553	1,208,941,444	1,210,075,799
1998	1,699,644,332	1,732,661,013	1,767,983,058	1,807,391,230	1,829,405,683	1,841,335,091	1,847,821,237	1,852,318,737	1,855,440,919	1,859,744,816	1,863,272,701	1,866,310,311	1,868,857,814	1,870,677,019	1,872,062,704
1999	2,501,886,689	2,556,988,433	2,613,802,155	2,647,204,379	2,671,322,108	2,683,601,489	2,690,757,270	2,696,636,923	2,702,948,284	2,709,590,524	2,714,248,026	2,718,325,875	2,721,676,960	2,723,873,851	2,725,351,525
2000	2,381,813,496	2,428,938,804	2,458,889,477	2,482,267,622	2,493,464,269	2,500,758,435	2,504,890,609	2,509,983,380	2,514,470,918	2,519,097,968	2,522,661,706	2,525,517,629	2,527,741,523	2,529,218,514	2,530,420,840
2001	3,564,942,488	3,619,505,685	3,652,806,194	3,671,176,142	3,682,428,462	3,690,659,586	3,699,359,572	3,707,364,246	3,713,194,084	3,718,453,334	3,723,135,261	3,726,642,718	3,729,926,060	3,732,037,158	3,733,479,361
2002	4,039,061,340	4,085,658,825	4,113,748,977	4,126,753,333	4,138,282,555	4,150,421,890	4,159,998,839	4,167,178,063	4,173,030,386	4,178,133,945	4,181,899,226	4,185,620,229	4,188,675,776	4,191,495,238	4,193,083,491
2003	4,767,192,837	4,801,473,146	4,816,963,318	4,834,818,542	4,850,441,205	4,863,774,243	4,875,715,427	4,883,660,584	4,891,775,731	4,898,139,795	4,904,076,449	4,909,295,597	4,913,328,933	4,917,012,228	4,919,053,899
2004	6,295,746,914	6,321,796,332	6,348,716,035	6,372,565,075	6,391,126,355	6,407,799,240	6,420,712,574	6,431,742,339	6,440,975,687	6,449,196,906	6,456,713,027	6,462,874,554	6,468,105,672	6,471,941,210	6,474,780,251
2005	5,645,006,645	5,671,213,075	5,691,407,682	5,707,465,928	5,722,240,401	5,732,747,638	5,742,734,034	5,750,250,290	5,757,721,429	5,764,385,553	5,770,312,644	5,775,463,873	5,779,551,623	5,783,014,793	5,784,851,945
2006	7,328,537,151	7,355,130,338	7,375,516,244	7,394,718,277	7,409,162,295	7,421,084,239	7,430,735,216	7,438,411,614	7,445,755,778	7,452,922,742	7,458,006,820	7,462,353,998	7,466,486,029	7,468,954,430	7,471,612,058
2007	9,524,793,910	9,558,548,130	9,584,827,619	9,605,758,923	9,623,058,922	9,637,036,831	9,649,283,589	9,659,435,448	9,669,419,591	9,678,348,396	9,686,903,812	9,692,457,561	9,697,906,809	9,701,494,730	9,703,991,859
2008	21,281,778,135	21,350,738,312	21,402,958,667	21,447,088,649	21,484,662,272	21,515,320,739	21,537,978,476	21,561,392,128	21,580,186,337	21,597,327,592	21,612,151,721	21,624,824,637	21,634,835,997	21,642,967,255	21,648,701,197
2009	19,652,218,667	19,724,812,598	19,783,167,052	19,827,410,120	19,864,572,967	19,901,398,312	19,924,919,170	19,945,740,316	19,960,619,304	19,975,877,669	19,988,647,988	19,999,918,291	20,008,834,946	20,015,886,047	20,020,280,433
2010	7,893,529,385	7,940,501,728	7,991,075,134	8,020,990,129	8,043,378,754	8,064,157,908	8,081,011,182	8,096,904,887	8,109,962,359	8,122,278,475	8,132,359,290	8,140,423,961	8,147,027,534	8,152,530,346	8,156,118,668
2011	3,052,014,950	3,086,863,442	3,107,497,652	3,124,602,296	3,139,454,519	3,151,367,827	3,161,741,002	3,171,215,371	3,178,436,114	3,186,794,504	3,192,254,750	3,197,488,680	3,202,292,142	3,205,541,756	3,207,764,702
2012	1,999,564,554	2,024,153,691	2,052,706,969	2,072,045,430	2,087,129,366	2,099,772,091	2,109,667,815	2,119,760,260	2,127,338,315	2,134,985,789	2,141,472,420	2,147,352,489	2,152,122,790	2,155,575,027	2,157,685,475
2013	2,289,928,303	2,341,681,141	2,387,771,027	2,424,243,782	2,457,202,028	2,483,253,339	2,503,092,618	2,520,962,192	2,538,549,793	2,553,191,241	2,565,719,740	2,576,242,876	2,584,510,267	2,592,075,499	2,596,569,612
2014	1,219,878,670	1,239,548,274	1,255,475,998	1,268,836,733	1,278,556,104	1,289,010,086	1,295,858,948	1,301,738,627	1,308,319,014	1,314,206,824	1,318,675,847	1,321,794,264	1,325,054,982	1,327,535,039	1,329,212,103
2015	1,671,950,700	1,697,657,126	1,718,467,378	1,738,609,561	1,752,487,104	1,764,741,525	1,775,412,046	1,782,925,616	1,790,980,789	1,797,919,138	1,804,063,415	1,808,217,784	1,812,167,002	1,815,579,611	1,817,852,246
2016	2,259,824,802	2,298,180,741	2,336,711,056	2,361,053,435	2,382,379,758	2,397,240,326	2,411,211,453	2,423,085,669	2,432,876,113	2,442,364,674	2,451,050,404	2,457,967,341	2,463,759,492	2,468,576,896	2,472,178,939
2017	3,400,467,672	3,447,092,799	3,487,387,231	3,520,257,230	3,548,985,612	3,570,851,320	3,589,986,546	3,605,844,826	3,620,902,194	3,633,612,070	3,647,232,827	3,657,796,386	3,664,779,615	3,671,213,265	3,675,027,477
2018	4,127,945,580	4,181,501,013	4,223,606,647	4,259,686,083	4,301,697,188	4,328,320,617	4,350,373,702	4,368,616,433	4,385,373,860	4,401,219,091	4,414,766,517	4,426,817,253	4,438,337,380	4,446,127,343	4,450,973,020
2019	4,192,295,946	4,254,157,397	4,299,834,617	4,339,641,194	4,369,024,732	4,398,108,961	4,418,963,285	4,436,703,483	4,453,331,697	4,468,826,959	4,480,552,433	4,490,871,753	4,500,087,253	4,508,468,908	4,513,718,990
2020	6,130,190,075	6,271,441,422	6,373,949,424	6,456,614,937	6,528,517,878	6,582,524,454	6,627,560,538	6,665,762,806	6,701,807,304	6,730,927,643	6,754,223,254	6,775,885,260	6,793,447,700	6,805,163,655	6,813,153,920

Table 15: Cumulative Loss Severity = Table 14/Table 13
Loss Severity for Each Evaluation Year

Evaluation Year (1–15)

Fiscal Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1990	80.71%	54.46%	50.32%	49.76%	50.11%	50.36%	50.70%	50.65%	50.25%	50.02%	49.79%	49.62%	49.53%	49.45%	49.39%
1991	40.02%	51.67%	51.06%	51.29%	51.71%	52.12%	51.92%	51.23%	50.78%	50.31%	50.03%	49.78%	49.61%	49.51%	49.47%
1992	44.30%	53.40%	53.79%	53.28%	53.52%	52.70%	50.90%	49.88%	49.05%	48.35%	47.82%	47.48%	47.31%	47.28%	47.27%
1993	36.77%	55.00%	55.12%	54.32%	51.71%	48.90%	47.18%	45.93%	45.02%	44.38%	44.03%	43.83%	43.76%	43.77%	43.80%
1994	55.89%	58.55%	57.55%	52.37%	47.57%	45.14%	43.52%	42.36%	41.55%	41.06%	40.78%	40.74%	40.74%	40.81%	40.90%
1995	55.17%	59.44%	47.81%	42.14%	40.45%	39.39%	38.36%	37.75%	37.39%	37.17%	37.15%	37.18%	37.35%	37.53%	37.70%
1996	43.09%	39.48%	37.51%	37.17%	36.06%	35.09%	34.40%	34.14%	33.96%	34.00%	34.13%	34.32%	34.57%	34.82%	35.13%
1997	33.27%	38.74%	38.30%	36.39%	34.85%	33.94%	33.55%	33.36%	33.46%	33.63%	33.96%	34.38%	34.72%	35.15%	35.50%
1998	32.15%	39.55%	35.18%	32.60%	31.13%	30.92%	30.80%	31.00%	31.33%	31.90%	32.52%	33.11%	33.80%	34.42%	34.93%
1999	39.39%	37.51%	33.31%	30.80%	30.55%	30.61%	31.12%	31.52%	32.15%	32.96%	33.64%	34.42%	35.23%	35.83%	36.33%
2000	35.54%	35.03%	32.22%	33.02%	33.24%	33.74%	34.31%	35.03%	35.94%	36.67%	37.53%	38.25%	38.81%	39.26%	39.52%
2001	30.81%	33.37%	35.42%	35.38%	35.88%	36.49%	37.50%	38.80%	39.88%	41.12%	42.26%	43.09%	43.72%	44.07%	44.43%
2002	34.45%	36.79%	37.76%	38.65%	39.07%	40.30%	41.81%	43.25%	44.90%	46.28%	47.39%	48.14%	48.52%	48.93%	49.32%
2003	47.38%	44.38%	43.12%	42.12%	43.07%	45.15%	46.89%	49.12%	50.80%	52.13%	52.93%	53.15%	53.37%	53.67%	53.91%
2004	46.54%	44.82%	42.78%	44.10%	47.13%	49.56%	52.01%	53.98%	55.38%	56.15%	56.18%	56.40%	56.68%	56.94%	57.08%
2005	37.07%	40.92%	45.49%	50.34%	53.53%	56.49%	58.48%	59.84%	60.55%	60.59%	60.69%	60.96%	61.25%	61.41%	61.51%
2006	46.79%	48.01%	54.86%	58.41%	61.45%	63.41%	64.49%	64.94%	64.81%	64.86%	65.09%	65.31%	65.49%	65.57%	65.62%
2007	57.19%	57.84%	60.72%	64.25%	66.15%	67.23%	67.26%	66.87%	66.77%	66.94%	67.12%	67.28%	67.39%	67.45%	67.46%
2008	58.80%	61.80%	64.69%	66.94%	67.70%	66.47%	65.50%	65.16%	65.26%	65.52%	65.74%	65.88%	65.97%	65.96%	65.96%
2009	66.72%	63.47%	65.36%	65.43%	62.51%	60.71%	60.26%	60.43%	60.86%	61.24%	61.46%	61.59%	61.62%	61.64%	61.66%
2010	67.67%	66.65%	64.12%	58.51%	55.34%	54.64%	55.20%	55.99%	56.60%	57.01%	57.19%	57.24%	57.31%	57.36%	57.44%
2011	73.57%	66.75%	58.37%	52.36%	51.26%	52.40%	53.61%	54.38%	54.89%	55.11%	55.32%	55.43%	55.52%	55.65%	55.74%
2012	50.48%	62.89%	51.57%	50.57%	51.87%	53.90%	55.27%	55.87%	56.12%	56.32%	56.46%	56.64%	56.82%	56.92%	56.98%
2013	63.54%	49.75%	50.56%	52.93%	54.85%	56.62%	57.59%	58.12%	57.88%	57.86%	57.99%	58.20%	58.36%	58.44%	58.46%
2014	32.79%	45.95%	48.12%	51.03%	53.74%	55.07%	55.93%	55.98%	55.95%	56.19%	56.65%	56.74%	56.84%	56.93%	56.95%
2015	23.35%	52.50%	53.09%	55.85%	57.43%	58.74%	58.41%	58.10%	58.57%	58.84%	58.98%	59.04%	59.04%	59.08%	59.09%
2016	54.82%	61.24%	60.96%	61.85%	63.00%	59.94%	58.94%	59.01%	59.44%	59.76%	59.79%	59.77%	59.79%	59.84%	59.85%
2017	42.18%	61.14%	63.14%	64.15%	57.09%	55.89%	56.25%	57.01%	57.27%	57.41%	57.47%	57.44%	57.44%	57.44%	57.42%
2018	46.83%	66.52%	66.63%	55.68%	56.00%	56.44%	57.29%	57.37%	57.40%	57.46%	57.58%	57.58%	57.59%	57.56%	57.58%
2019	67.32%	70.78%	54.24%	56.59%	57.74%	58.38%	58.87%	58.96%	59.06%	59.03%	59.06%	59.01%	58.97%	58.95%	58.93%
2020	0.00%	58.96%	58.52%	59.92%	61.15%	61.50%	61.68%	61.46%	61.33%	61.23%	61.08%	61.00%	60.98%	60.93%	60.87%

Evaluation Year (16–30)

Fiscal Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1990	49.38%	49.38%	49.41%	49.46%	49.48%	49.52%	49.56%	49.58%	49.59%	49.59%	49.60%	49.61%	49.61%	49.61%	49.61%
1991	49.47%	49.50%	49.55%	49.58%	49.61%	49.65%	49.67%	49.68%	49.69%	49.70%	49.71%	49.71%	49.72%	49.72%	49.72%
1992	47.30%	47.36%	47.40%	47.44%	47.50%	47.52%	47.55%	47.55%	47.56%	47.56%	47.58%	47.58%	47.57%	47.57%	47.57%
1993	43.86%	43.91%	43.97%	44.04%	44.08%	44.10%	44.10%	44.11%	44.15%	44.17%	44.18%	44.18%	44.19%	44.19%	44.20%
1994	40.96%	41.09%	41.18%	41.26%	41.33%	41.35%	41.39%	41.46%	41.48%	41.47%	41.49%	41.50%	41.51%	41.51%	41.52%
1995	37.91%	38.09%	38.22%	38.31%	38.38%	38.47%	38.55%	38.58%	38.60%	38.63%	38.64%	38.65%	38.66%	38.67%	38.67%
1996	35.40%	35.62%	35.79%	35.87%	36.01%	36.16%	36.25%	36.31%	36.35%	36.37%	36.38%	36.40%	36.41%	36.42%	36.43%
1997	35.78%	36.07%	36.21%	36.38%	36.57%	36.71%	36.78%	36.82%	36.85%	36.88%	36.90%	36.93%	36.94%	36.96%	36.97%
1998	35.36%	35.60%	35.87%	36.22%	36.42%	36.52%	36.57%	36.60%	36.63%	36.67%	36.70%	36.72%	36.74%	36.75%	36.76%
1999	36.62%	36.92%	37.25%	37.45%	37.60%	37.67%	37.72%	37.75%	37.79%	37.82%	37.85%	37.87%	37.88%	37.89%	37.90%
2000	39.85%	40.16%	40.36%	40.52%	40.58%	40.63%	40.65%	40.68%	40.71%	40.74%	40.76%	40.78%	40.79%	40.79%	40.80%
2001	44.79%	45.01%	45.16%	45.23%	45.28%	45.31%	45.33%	45.36%	45.38%	45.40%	45.41%	45.42%	45.43%	45.44%	45.44%
2002	49.59%	49.74%	49.83%	49.87%	49.88%	49.90%	49.92%	49.94%	49.95%	49.96%	49.97%	49.97%	49.98%	49.98%	49.98%
2003	54.09%	54.17%	54.20%	54.21%	54.23%	54.24%	54.26%	54.28%	54.29%	54.29%	54.30%	54.30%	54.30%	54.30%	54.30%
2004	57.18%	57.22%	57.23%	57.24%	57.25%	57.26%	57.27%	57.27%	57.28%	57.28%	57.28%	57.28%	57.28%	57.28%	57.28%
2005	61.54%	61.54%	61.54%	61.55%	61.56%	61.57%	61.58%	61.58%	61.58%	61.58%	61.58%	61.58%	61.58%	61.58%	61.58%
2006	65.62%	65.63%	65.63%	65.63%	65.62%	65.62%	65.62%	65.61%	65.61%	65.60%	65.60%	65.60%	65.59%	65.59%	65.59%
2007	67.46%	67.45%	67.45%	67.45%	67.45%	67.45%	67.44%	67.44%	67.43%	67.43%	67.42%	67.42%	67.42%	67.42%	67.42%
2008	65.97%	65.98%	65.98%	65.98%	65.98%	65.98%	65.98%	65.98%	65.98%	65.98%	65.98%	65.98%	65.98%	65.97%	65.97%
2009	61.69%	61.71%	61.71%	61.72%	61.72%	61.73%	61.73%	61.73%	61.73%	61.73%	61.73%	61.73%	61.73%	61.73%	61.73%
2010	57.48%	57.51%	57.56%	57.57%	57.58%	57.58%	57.59%	57.59%	57.59%	57.60%	57.60%	57.60%	57.60%	57.60%	57.60%
2011	55.85%	55.92%	55.96%	55.99%	56.00%	56.01%	56.02%	56.02%	56.03%	56.03%	56.03%	56.03%	56.03%	56.02%	56.02%
2012	57.01%	57.01%	57.10%	57.08%	57.09%	57.10%	57.12%	57.13%	57.13%	57.14%	57.15%	57.15%	57.16%	57.16%	57.16%
2013	58.47%	58.46%	58.41%	58.38%	58.32%	58.32%	58.32%	58.30%	58.30%	58.29%	58.28%	58.28%	58.27%	58.25%	58.24%
2014	56.98%	56.99%	56.99%	56.98%	56.99%	57.01%	57.00%	57.01%	57.00%	57.00%	57.00%	57.00%	57.00%	57.00%	57.00%
2015	59.06%	59.05%	59.05%	59.03%	59.01%	59.02%	59.01%	59.01%	58.99%	58.98%	58.98%	58.98%	58.97%	58.96%	58.95%
2016	59.83%	59.81%	59.85%	59.84%	59.83%	59.81%	59.79%	59.79%	59.79%	59.78%	59.78%	59.78%	59.77%	59.77%	59.76%
2017	57.45%	57.43%	57.42%	57.40%	57.39%	57.38%	57.36%	57.37%	57.36%	57.36%	57.35%	57.34%	57.34%	57.33%	57.33%
2018	57.56%	57.54%	57.54%	57.52%	57.54%	57.53%	57.53%	57.54%	57.52%	57.52%	57.52%	57.51%	57.50%	57.50%	57.49%
2019	58.90%	58.94%	58.94%	58.93%	58.93%	58.92%	58.93%	58.91%	58.91%	58.91%	58.91%	58.90%	58.90%	58.90%	58.89%
2020	60.80%	60.82%	60.78%	60.76%	60.73%	60.72%	60.70%	60.68%	60.68%	60.67%	60.66%	60.65%	60.64%	60.64%	60.63%