HOME AFFORDABLE MODIFICATION PROGRAM

BASE NET PRESENT VALUE (NPV) MODEL V7.0
MODEL DOCUMENTATION

UPDATE: OCTOBER 26, 2015

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I. Overview

A central element of the Home Affordable Modification Program (HAMP) is the use of a net present value (NPV) model. An NPV model is used by servicers participating in HAMP as a tool for deciding whether to modify a troubled mortgage that is eligible for subsidies under the program.

The base NPV model described in this paper meets the specifications put forward under the Making Home Affordable (MHA) Program. The documentation of the base NPV model methodology, provided herein, provides servicers the calculation logic for integrating HAMP NPV evaluation capabilities into their existing servicing platforms. This model document also describes the NPV evaluation tool used on the HAMP NPV Transaction Portal.

The base NPV model assesses borrower and loan information for HAMP eligibility and determines whether a proposed modification under the program tests NPV positive or negative. The test result is NPV positive when the total discounted value of expected cash flows for the modified loan is higher than the total discounted value of expected cash flows for the unmodified loan. A negative NPV test result occurs when the opposite is true – the expected value of the cash flows for the modified loan is lower than that of the unmodified loan. If the result of the NPV test is positive, then it is beneficial to an investor to modify the loan. The base NPV model guides this assessment for all servicers participating in HAMP.

The NPV test will be required for each loan that is in imminent default or is at least 60 days delinquent under the Mortgage Bankers Association (MBA) delinquency calculation. If a modification that follows the HAMP program guidelines is NPV positive, the servicer participating in this program is required to perform a HAMP modification.

This document discusses the base NPV model calculation logic, model inputs and outputs, as well as the base model components and equations. It also outlines the requirements for customizing the base model for servicers that are eligible for such customization. The final section reviews the waterfall logic that generates the modification terms, which is incorporated in an NPV output "Waterfall Check" to provide a reasonableness check on the modification terms submitted by servicers.

II. Significant Model Changes Summary

In response to Treasury policy updates, servicers' feedback, and planned model enhancements, the following updates have been made to the base NPV model.

A. Version 5.0 to Version 6.0

Borrower Pay-for-Performance Incentive Expansion (p. 9)

- The HAMP Tier 1 "pay-for-performance" principal balance reduction payment has been extended for one year and increased to $5,000 in year six.
- Borrowers in HAMP Tier 2 permanent modifications will earn a one-time "pay-for-performance" principal balance reduction payment of $5,000 in year six.

Clarification of Incentive Payments Included in the Base NPV Model Calculation (p. 9)

- Per section 9.6 of the MHA handbook, if a principal curtailment amount is greater than or equal to the interest-bearing UPB of a loan with principal forbearance, that principal curtailment must first completely pay off the existing forbearance. Any remaining curtailment funds should be applied to the interest-bearing UPB.

De Minimis Test Clarification (pp. 11)

- Passing the de minimis test is not required to qualify for the $5,000 Borrower Pay-for-Performance Payment in year six.

Discounted Future Cash Flow Model Update (pp. 43-46)

- To be consistent with section 9.6 of the MHA handbook, the forbearance variable in Case 3. Mod:NPV {Loan Cures} has been updated from a static variable to one that changes with time.

Prepayment Model Update (p. 49)

- To be consistent with section 9.6 of the MHA handbook, the forbearance variable within the calculation for INCT has been updated from a static variable to one that changes with time.
- The prepayment model has been updated to take into account the expansion of the Borrower Pay-for-Performance Incentives.

B. Version 6.0 to Version 7.0

Tier 2 Waterfall Forbearance and Forgiveness Eligibility Change (p. 60)

- Effective January 1, 2016 per Section 6.3.2.4 of Chapter II of the MHA Handbook, as amended on September 24, 2015 in order to bring HAMP Tier 2 in line with Streamline HAMP, loans with a post-capitalization MTMLTV > 115% will be eligible for forbearance or forgiveness.

III. Considerations for Cash Flows in the Base NPV Model

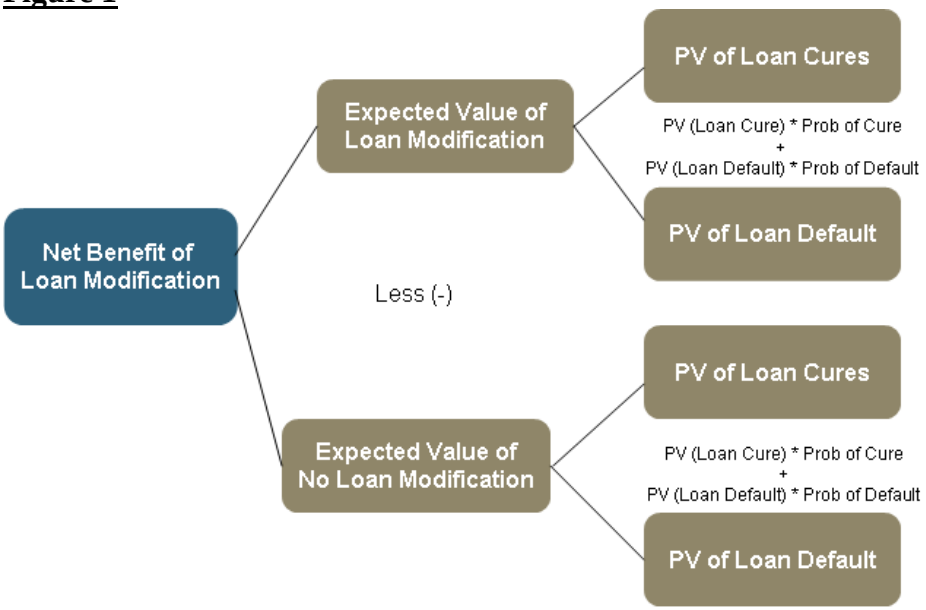
This section briefly summarizes the cash flows considered in the base NPV model calculation. In addition to the cash flows from the principal and interest of the loan, government incentives are provided to the investors under the HAMP program. The timing and amount of these incentives are specified below.

The reduction in monthly payment provided by the modification affects (1) the borrower's intent and capacity to repay the loan and (2) the timing and nature of subsequent loss mitigation or resolution activities. The modification reduces the cash flows (principal and interest) to the investor through interest rate reduction, term extension, principal forbearance, and/or principal forgiveness. However, the modification also reduces the borrower's monthly debt burden, which is expected to improve loan performance by reducing the probability of default.

Each loan has a probability of default and cure in both the no-modification and modification scenarios. (For purposes of the NPV test, default is defined as an event that ends in foreclosure and property disposition, and therefore has no possibility of cure; the NPV model assumes some rate of cure for loans in any stage of delinquency.) The default model of the base NPV model predicts four probabilities of default and cure:

1. Probability of cure for an unmodified loan
2. Probability of default for an unmodified loan
3. Probability of cure for a modified loan
4. Probability of default for a modified loan

Figure 1



The present value of each scenario is calculated and weighted by the scenario's probability. The probability-weighted present values of the two "no mod" scenarios are added to calculate the total expected present value of the "no mod" decision. The probability-weighted present values of the two "mod" scenarios are added to calculate the total expected present value of the "mod" decision. The expected present value of the "no mod" decision is compared against the expected present value of the "mod" decision to determine whether the proposed modification is NPV positive or negative. If the expected value of the "mod" decision is greater than the expected value of the "no mod" decision, the servicer is required to proceed with loan modification.

The servicer must input the data required by the base NPV model – essentially, current financial information for the borrower, the existing loan terms, and the terms of the proposed modification.

HAMP: Tier 1 and Tier 2

In an effort to continue to provide meaningful solutions to the housing crisis, the Obama Administration expanded the population of homeowners that may be eligible for HAMP under a new "HAMP Tier 2" alternative, enabling more struggling homeowners to take advantage of affordable mortgage payment relief.

HAMP Tier 2 became effective on June 1, 2012. It is intended to extend modification opportunities to borrowers who do not meet the eligibility or underwriting requirements of the existing program (referred to as "HAMP Tier 1") guidelines including loans secured by properties that are not owner-occupied.

The base NPV model will continue to calculate the NPV of the modification under the standard HAMP Tier 1 Waterfall and the Alternative Waterfall. Beginning with v5.0, the base NPV model will also generate waterfall terms and the NPV calculation under the Tier 2 Waterfall and, if eligible, the Tier 2 Alternative Waterfall in a single evaluation. Please refer to Section IX for more details on the Tier 2 Waterfall calculation.

The base NPV model will automatically evaluate non-GSE eligible owner-occupied properties for both HAMP Tier 1 and Tier 2, if applicable, and non-GSE eligible non-owner-occupied properties for Tier 2. The model will not evaluate GSE loans for Tier 2 because the GSEs do not participate in Tier 2. Please refer to the MHA Handbook for complete details on the eligibility criteria and policy for HAMP Tier 2.

Under Tier 2, modifications must meet a payment change requirement. As of July 1, 2014 the minimum payment reduction is 0%—meaning the post-modification principal and interest payment must not be greater than the pre-modification principal and interest payment in effect at the time of HAMP Tier 2 consideration. Servicers may, subject to investor guidance, establish a minimum principal and interest payment reduction requirement for HAMP Tier 2 (Servicer's HAMP Tier 2 Minimum Payment Reduction), provided a reduction of no more than 10 percent is required. See Appendix D for history of P&I payment change requirements.

Under Tier 2, modifications must have a post-modification front-end DTI no less than 10 percent or greater than 55 percent. Servicers may, subject to investor guidance, select a different DTI range as long as the low end of the DTI range must be equal to or greater than 10 percent but not more than 25 percent and the high end must be equal to or greater than 42 percent but not more than 55 percent). Loans outside of these thresholds will not be eligible for Tier 2. See Appendix D for history of allowable DTI range requirements.

If the loan is NPV positive for HAMP Tier 1 under the standard modification waterfall, a HAMP Tier 1 trial period plan must be offered to the borrower regardless of the HAMP Tier 2 NPV result.

If the loan is NPV negative for HAMP Tier 1 under the standard modification waterfall and the investor has authorized a different threshold, the servicer may offer the borrower a HAMP Tier 1 trial period plan.

If the borrower is not offered a HAMP Tier 1 trial period plan and is NPV positive under the HAMP Tier 2 standard modification waterfall, the borrower must be offered a HAMP Tier 2 trial period plan.

If the borrower is NPV negative for the HAMP Tier 2 standard modification waterfall, the servicer may, based on investor guidance, offer a HAMP Tier 2 trial period plan or must consider the borrower for other available loss mitigation options, including HAFA.

Guidance on the NPV Date

An important concept to using the NPV model is the "NPV Date." It is the first date that the loan was evaluated for HAMP. This date must stay the same for subsequent NPV runs for the loan, with the exception described below.

For loans that were evaluated for HAMP prior to June 1, 2012 (NPV Date prior to June 1, 2012) and require re-evaluation under HAMP Tier 2, the servicer should use **the date that the loan is evaluated under NPV 5.0 or higher for the first time** as the NPV Date. This requirement applies to the following types of loans identified in Supplemental Directive 12-02 and Supplemental Directive 14-03 as potentially being eligible for re-evaluation for modification under HAMP Tier 2:

1. loans that defaulted on a HAMP Tier 1 trial period or permanent modification
2. loans that remain in good standing in a HAMP Tier 1
3. loans that were denied a HAMP Tier 1 modification because they were NPV negative
4. loans that were denied a HAMP Tier 1 modification because they had excessive forbearance or had a front-end debt-to-income (DTI) under 31%

If the servicer chooses to subsequently re-run a loan through NPV 5.0 or higher, the servicer should use the date of the first evaluation under NPV v5.0 or higher as the NPV Date subsequent evaluations. For loans that are evaluated for HAMP (Tier 1 or Tier 2) for the first time on or after June 1, 2012, the servicer should use the date that the loan is evaluated for HAMP for the first time as the NPV Date. This date must be used as the NPV date for subsequent NPV runs of the loan.

When the servicer re-evaluates a loan that satisfies the HAMP basic eligibility criteria as well as any of the three criteria listed above for the first time through the NPV model after June, 1, 2012: If the inputs are less than 90 days old from the "V5 or higher" NPV Date and the inputs have not changed significantly, then servicers should hold those inputs constant for the NPV re-evaluation under NPV v5.0 or higher. However, if the inputs have changed significantly, the servicer may, within the HAMP guidelines, change the loan and borrower data NPV inputs as necessary for evaluating loans. Those attributes should be kept constant for subsequent NPV evaluations.

Incentive Payments Included in the Base NPV Model Calculation

HAMP Tier 1 Payment Reduction Cost Share for Investors

For every month the borrower is in good standing under a HAMP permanent modification, the U.S. Treasury, acting through Fannie Mae as its fiscal agent, reimburses the investor 50% of the cost of lowering monthly payments from a level consistent with a 38% DTI[1] to that consistent with the target DTI of 31%, for up to five years. If the borrower's DTI before the modification is below 38%, the subsidy is equal to 50% of the smaller payment reduction needed to achieve a 31% DTI. If the DTI after the modification is higher than 31%, the loan is not eligible for HAMP Tier 1 and receives no subsidy. While the servicer may reduce the payment to achieve a DTI ratio below 31%, the subsidy payments will only be calculated based on the reduction between 38% DTI and 31% DTI.

HAMP Tier 1 Payment Reduction Cost Share Incentive
= 50%* [MIN(38% or pre-mod DTI) – 31% DTI]

The Payment Reduction Cost Share incentive should be calculated based on the full payment reduction, including PRA principal reduction.

HAMP Tier 2 Payment Reduction Cost Share for Investors

Investors will be eligible for Payment Reduction Cost Share Incentives for HAMP Tier 2 permanent modifications equal to 50% of (i) the dollar difference between borrower's post modification P&I Payment under the HAMP Tier 2 modification and the borrower's pre-modification P&I Payment or (ii) 15% of the borrower's pre-modification P&I Payment, whichever is lower, paid out monthly over five years

[1] For the purposes of the base NPV model calculation, DTI refers to the front-end ratio. Front-end DTI is the ratio of principal, interest, taxes, insurance (including homeowners' insurance and hazard and flood insurance), and homeowners' association and/or condominium fees (PITIA) to gross monthly income. Mortgage insurance is excluded from the PITIA calculation.

HAMP Tier 2 Payment Reduction Cost Share Incentive
= 50%* MIN[(post-mod P&I – pre-mod P&I) , (15% * pre-mod P&I)]

$1,500 Non-Delinquency Modification Incentive for Investor
If the borrower is current at the beginning of the trial period and current at the end of the trial period, the investor will be paid $1,500 by the HAMP Program. This incentive is available for HAMP Tier 1 and owner-occupied HAMP Tier 2 modifications. Non-owner-occupied modifications must be at least 60 days delinquent to be eligible for Tier 2, and thus will not qualify for this incentive.

Borrower Pay-for-Performance Payments
Borrowers who make timely monthly payments are eligible to accrue up to $1,000 of principal reduction each year for five years, or a maximum total of $5,000 over five years, in HAMP Tier 1. The borrower's mortgage payment must be made on time in order to accrue the monthly Pay-for-Performance Payment. Annual principal balance reductions will start 12 months after entering the trial period, provided the borrower remains eligible for the program. The payment will be applied by the servicer to reduce the principal balance by up to $1,000 per year for five years[2], provided the borrower remains eligible. The payment will be calculated as the lesser of (i) $1,000 ($83.33/month), or (ii) half of the reduction in the borrower's annualized monthly payment to the 31% DTI payment.

Effective in Version 6, these HAMP Tier 1 Pay-for-Performance Payments are extended for one year, and increased to a one-time $5,000 principal reduction in year six. Borrowers in HAMP Tier 2 permanent modifications are eligible for a one-time principal balance reduction payment of $5,000 in year six, but are not eligible for the original Tier 1 payments of up to $1,000 for years one through five.

The $5,000 principal balance reduction payment for both Tier 1 and Tier 2 will be payable the month after the sixth anniversary of the month in which the HAMP trial period plan effective date occurred, as long as the loan is in good standing and has not been paid in full, without regard to the number of current payments or whether the monthly mortgage payment was reduced through HAMP by six percent or more.

For borrowers who do not default, the base NPV model assumes the full amount of the Borrower Pay-for-Performance Payments is accrued annually. This amount is applied to reduce the principal for that program year.

If a principal curtailment, such as a Borrower Pay-for-Performance Payment, is received from or on behalf of the borrower on a loan that has a principal forbearance, servicers are instructed to apply the principal curtailment to the interest-bearing UPB. If, however, the principal curtailment

[2] At the interest rate step-up after 5 years, the UPB used for re-amortization should be the scheduled UPB. The Borrower Pay-for-Performance Payment should not be deducted from the UPB for re-amortization.

amount is greater than or equal to the interest bearing UPB, then the curtailment should be first be applied to the principal forbearance. If the curtailment completely satisfies the principal forbearance, any remaining funds should then be applied to the interest-bearing UPB. This eliminates the possibility of a curtailment paying off the interest-bearing portion of the UPB, which would cause the entire loan to become due and payable, and force the borrower to pay off the principal forbearance portion of the loan balance as a balloon payment.

Home Price Decline Protection Incentive (HPDP)

HPDP is an investor incentive to offset some of the investors' risk of loss exposure due to near-term negative momentum in the local market home prices. The HPDP incentive was effective beginning 9/1/2009, and loans tested for modification eligibility on or after that date may qualify for HPDP payments. This incentive is available now for both HAMP Tier 1 and Tier 2.

The HPDP payment data is used as an input to the NPV calculation. An HPDP payment table is calculated every quarter to show the full HPDP payment for each metropolitan statistical area (MSA) and unpaid principal balance (UPB) quintile, and is calculated every quarter. The quarter for which the payment is used in the NPV calculation is set on the "NPV Date" – the date the loan was first submitted through the NPV model to determine trial modification eligibility.

The HPDP incentive payments are calculated based upon the following three characteristics of the mortgage loan receiving a HAMP modification:

1. an estimate of the cumulative projected home price decline over the next year, as measured by changes in the home price index over the previous two quarters in the applicable local market (MSA or non-MSA region) in which the related mortgaged property is located;
2. the UPB of the mortgage loan prior to modification under HAMP; and
3. the mark-to-market loan-to-value ratio (MTMLTV) of the mortgage loan based on the UPB of the mortgage loan prior to modification under HAMP.

The first characteristic, the cumulative projected home price decline over the next year, expressed in percentage points (projected home price decline), is related to recent momentum in local market home prices. The projection is calculated from the percentage changes in the local home price index in the most recent previous two quarters for which data is available.

The second characteristic, the UPB of the mortgage loan prior to modification under HAMP, involves assignment of the loan to one of five UPB quintiles. The quintile assignments determine

the dollar payment per percentage point of projected price decline. Quintile assignments will not change over the course of the program.

Quintile	UPB Prior to Modification	Quintile Payment per Percentage Point Decline in House Price Index
1	$0 – $73,000	$200
2	greater than $73,000 – $116,000	$300
3	greater than $116,000 – $169,000	$400
4	greater than $169,000 – $259,000	$500
5	greater than $259,000	$600

The third characteristic, the MTMLTV of the mortgage loan prior to modification under HAMP is used to determine the weighting factor that is applied to the HPDP payment. The weighting factor is multiplied by the HPDP payment assigned to the MSA/quintile to which the loan is attributed.

MTMLTV	Weighting Factor
less than 70%	0
at least 70% but less than 80%	1/3
at least 80% but less than 90%	2/3
90% or greater	1

An investor will accrue 1/24 of the total HPDP incentive payment for every month in which the borrower remains in good standing under HAMP. The accrual starts at the beginning of the trial period. If the trial period is not completed successfully, no HPDP incentives will be paid to an investor. Payments of accrued HPDP incentives will be made on an annual basis on each of the first anniversary and the second anniversary of the trial period start date. For loans that lose good standing[3] or are paid in full, the accrued but unpaid HPDP incentive payments would be payable on the payment date in the month in which the loss of good standing or payoff is reported.

HPDP incentives should be calculated using the MTMLTV and UPB before any PRA principal reduction.

De Minimis Requirement for Incentives

To qualify for the $1,500 Non-Delinquency Modification Incentive, the $1,000 Borrower Pay-for-Performance Payments, and the Home Price Decline Protection Incentive, the modification must meet a "de minimis" test. Based on the proposed new mortgage payment – including principal, interest, taxes, insurance, and any homeowner association or condo fees (PITIA) – the modification must result in a payment that is at least 6% lower than the pre-modification PITIA payment. There is no de minimis test considered for the Payment Reduction Cost Share. Passing

[3] A borrower loses good standing under HAMP if he/she misses three payments on a HAMP modification (three payments are due and unpaid on the last day of the third month).

the de minimis test is not required to qualify for the $5,000 Borrower Pay-for-Performance Payment in year six.

Treatment of Mortgage Insurance

For loans that have mortgage insurance (MI) coverage, the value of a mortgage insurance claim is included in the base NPV model calculation. It is based on the value of the claim in the event of a default of the loan – both with a modification and without a modification.

In the event of a negative NPV result, the case may be referred to the appropriate MI company. The MI company will review the case, propose a partial claim payment, and document any proposed refinements to borrower and loan information based on MI company review. All new borrower and loan information must be consistent with HAMP guidance and based on more thorough examination of the case than the initial servicer underwriting analysis. Base NPV model assumptions such as discount rate risk premium and default/re-default equations will not be adjusted.

The base NPV model can then be re-run with any updated borrower and loan information, and with the incorporation of any proposed partial claim payment.

Principal Reduction Alternative (PRA) Program

The Principal Reduction Alternative (PRA) program gives servicers additional flexibility to offer relief to borrowers whose homes are worth significantly less than the remaining amounts owed on their first lien mortgage. Servicers are required to evaluate loans with a MTMLTV ratio of greater than 115% under both the Standard Waterfall and a PRA Alternative Waterfall. Since v4.0, the base NPV model calculates the NPV of the modification under the HAMP Standard Waterfall as well as the Alternative Waterfall.

HAMP Tier 1 PRA Alternative Waterfall

Under the Alternative Waterfall, servicers use principal reduction between Step 2 (capitalize arrearage) and Step 3 (reduce interest rate) of the Standard Waterfall set forth in Chapter II, Section 6.3 of the MHA Handbook as follows.

Step 1: Calculate Pre-Modification Debt to Income (DTI)

Calculate the borrower's front-end DTI based on pre-modification mortgage payment and gross monthly income. For adjustable-rate mortgage (ARM) or interest only (IO) loans not resetting within 120 days, use the pre-mod scheduled monthly mortgage payment (which, in the case of Pay Option Loans that are ARM loans, means the minimum payment required under the loan documents regardless of which payment the borrower elected to pay in the prior period) and the note interest rate in effect at the time of evaluation.

If the loan is an ARM, IO or other product type with a scheduled interest rate and payment change expected within 120 days, DTI is calculated as follows:

- For non-GSE loans, amortize the loan using the pre-mod UPB and the remaining term as of the data collection date, and the reset interest rate expected at the time of the next reset.
- For GSE loans, use the pre-mod monthly payment. For NPV evaluations, servicers should use the UPB as of the Data Collection Date. Servicers should not project or estimate the UPB as of a future date.

Step 2: Capitalize Arrearage
The servicer capitalizes accrued interest, out-of-pocket escrow advances to third parties, and any required escrow advances that will be paid to third parties by the servicer during the trial period plan as well as those servicing advances that are made for costs and expenses incurred in performing servicing obligations.

Step 3: Forgive Principal
Reduce the UPB by an amount necessary to achieve either i) the target monthly mortgage payment ratio of 31% or ii) a MTMLTV ratio equal to 115%, whichever is reached first. Servicers are allowed to reduce principal below 31% DTI or below 115% MTMLTV, however, principal reductions that bring the MTMLTV below 105% will only receive incentives on principal reductions down to 105%.

Steps 4, 5, 6: Reduce Interest Rate, Extend Term, Forbear Principal:
If the UPB is reduced to create a MTMLTV ratio of 115% and the target monthly mortgage payment remains above 31% (based on a fully amortizing principal and interest payment over the remainder of the pre-mod loan term and using the pre-mod mortgage interest rate; if the loan's interest rate is resetting within 120 days, use reset rate[4]), continue with the standard HAMP modification waterfall steps of reducing interest rate, extending term, and forbearing principal, each as necessary, until the target monthly mortgage payment ratio of 31% is achieved.

HAMP Tier 2 PRA Alternative Modification Waterfall
For HAMP Tier 2, the base NPV model will evaluate any loan with a post-capitalization MTMLTV ratio greater than 115 percent using the HAMP Tier 2 alternative modification waterfall that includes principal reduction amount equal to the lesser of (i) an amount that would create a post-modification MTMLTV ratio of 115 percent using the post-modified UPB of the mortgage loan (inclusive of capitalized arrearages) or (ii) 30 percent of the post-modified UPB of the mortgage loan (inclusive of capitalized arrearages).

As with HAMP Tier 1, participation in PRA under HAMP Tier 2 is optional. However, investors who offer principal forgiveness in HAMP Tier 2 are eligible for the increased investor PRA incentives announced in Supplemental Directive 12-01. While Servicers may elect to forgive

[4] If the loan payment will reset or recast in next 120 days:
For non-GSE loans, amortize the loan using the reset interest rate, current UPB, and the remaining term. For GSE loans, use the current monthly payment, which is the "Principal and Interest Payment before Modification" input field.

principal below 115 percent, in accordance with Section 13.3.4, Chapter II of the MHA Handbook, they will only be entitled to investor PRA incentives for amounts of forgiveness that result in a MTMLTV ratio equal to or greater than 105 percent.

If there is a limit on the forgiveness amount under the applicable servicing agreement or law, or if the servicer chooses to forgive more than the amount described above, the servicer should enter the amount of forgiveness in the "Tier 2 PRA Principal Forgiveness Override" field. The base NPV model will use the servicer-provided override forgiveness amount when generating the Tier 2 alternative modification waterfall terms.

If the Tier 2 PRA modified P&I payment fails to meet the P&I payment change or DTI requirements set forth by Treasury, or alternate eligibility requirements set by servicers in their written policy, the borrower is not eligible for a HAMP Tier 2 PRA modification. (See section "HAMP: Tier 1 and Tier 2" on p. 8 for detailed information).

Application of PRA and Incentives for HAMP Tier 1 and Tier 2

For both HAMP Tier 1 and Tier 2, the principal reduction amount under PRA will be initially placed in non-interest bearing forbearance and will be forgiven in equal installments over three years. If the borrower is in good standing, one third of the principal reduction amount will be forgiven on the anniversary date of the trial modification over the next three years. If the borrower is in good standing and pays the loan in full, he/she is immediately vested[5] and the remaining PRA forbearance is deducted from the principal balance. If the borrower loses good standing, any unapplied PRA forbearance will remain as non-interest bearing forbearance, and any PRA reduction accrued during the partial year will be forfeited.

PRA Incentives for HAMP Tier 1 and Tier 2

With respect to loans which were less than or equal to six months past due at all times during the 12 month period prior to the NPV evaluation date, investors will be entitled to receive $0.63 per dollar of principal reduction equal to or greater than 105% and less than 115% MTMLTV; $0.45 per dollar of principal reduction equal to or greater than 115% and less than or equal to 140% MTMLTV; and $0.30 per dollar of principal reduction in excess of 140% MTMLTV.

Principal Reduction Incentive Schedule: Per Dollar of UPB Forgiven in MTMLTV Ratio Range (Loans Less than or Equal to Six Months Past Due)		
MTMLTV Ratio Range		
105% to <115%	**115% to 140%**	**>140%**
$0.63	$0.45	$0.30

[5] This only applies if the pay-off occurs 30 days after the permanent modification and prior to the application of the entire PRA forbearance amount. The model assumes four months from the NPV Date; five months for current Fannie Mae loans.

Example: A borrower has an MTMLTV of 150% and the servicer will reduce it to 100%. For every dollar of principal reduction from 150%-140% MTMLTV, investors get $0.30/dollar; from 140%-115% MTMLTV, investors get $0.45/dollar; from 115%-105% MTMLTV, investors get $0.63/dollar; and less than 105% MTMLTV, investors do not get any incentives.

With respect to loans which were more than six months past due at any time during the 12 month period prior to the NPV evaluation date, irrespective of MTMLTV ratio range shown above, investors will be paid $0.18 per dollar of principal reduction and will not be eligible for incentives in the above extinguishment schedule.

Incorporation of PRA into the Base NPV Model

Consistent with program guidelines, all investor subsidies associated with the standard HAMP program will be the same under both the standard and PRA modification structures. The HPDP incentive will be calculated using the MTMLTV and UPB before applying PRA principal reduction and the Payment Reduction Cost Share incentive will be calculated based on the full payment reduction from 38% to 31% DTI, including any portion generated by principal reduction.

Because borrowers receive the principal reduction whether they prepay or continue to perform on their mortgage, their default and prepayment probabilities reflect the full impact of the principal reduction immediately. Default probabilities will therefore be calculated based on the MTMLTV and DTI reflecting the full PRA principal reduction amount. Likewise, prepayment probabilities reflect the MTMLTV associated with the lower balance after application of the principal reduction amount.

IV. Base NPV Model Components

Overall Process

The servicer makes contact with the borrower and determines whether he/she meets the basic eligibility criteria for HAMP. Alternatively, the borrower may contact the servicer to initiate the HAMP process. The servicer then obtains borrower information such as current gross income and mortgage-related and non-mortgage-related debt. The servicer then runs the loan through the HAMP waterfall(s) and determines the modification terms. The NPV test is performed to determine whether the modification terms have a positive NPV for the investor.

Base NPV Model Inputs

The base NPV model determines the present value of a loan's cash flows under three scenarios: 1) no modification, 2) modification under HAMP (with and without principal reduction, where applicable), 3) modification under Tier 2 (with and without principal reduction, where applicable). The model uses the following inputs in its equations:

- "User Inputs" – Such as borrower and loan information – data typically already in the servicer's system (columns A-AG, AQ, AR, AY from the table below).
- "Servicer Defined Inputs" – Servicer input of the risk premium, modification fees, and mortgage insurance partial payment amount (columns AH-AJ from the table below).
- The terms of the proposed modification under the HAMP Tier 1 standard waterfall (columns AK-AP from the table below).
- The terms of the proposed modification under the HAMP Tier 1 Principal Reduction Alternative waterfall (columns AS–AX from the table below)
- Additional data fields for the base NPV model to generate the Tier 2 modification terms and NPV results (columns AZ- BI)

Base NPV Model Inputs

Column	Label	Data Dictionary	Field Type	Field Validation
A	**Investor Code**	A code identifying the investor in the loan.	Enumerated List	1 – Fannie Mae 2 – Freddie Mac 3 – Private 4 - Portfolio 5 – Ginnie Mae
B	**Servicer Loan Number**	A unique identifier assigned by the servicer which is associated with a loan secured by a property.	Character	Maximum Length 30
C	**GSE Loan Number**	Fannie Mae or Freddie Mac Loan Number.	Character	Conditionally required – GSE loans only. Maximum Length 30
D	**HAMP Servicer Number**	A unique identifier assigned to each servicer that is participating in the HAMP.	Character	Maximum Length 9

Column	Label	Data Dictionary	Field Type	Field Validation
E	**Data Collection Date**	The date on which the UPB and associated remaining term data was collected. This is also the start date of the modification in the NPV model.	Date	Valid date is not in the future of the NPV Date and within the last 90 days from the NPV Date.
F	**Property - Number of Units**	The total number of dwelling units included in the property.	Number	Allowable values: 1,2,3,4
G	**First Payment Date at Origination**	The estimated date the first payment was made on the loan after origination.	Date	Valid date between 1/1/1960 and 03/01/2009
H	**Unpaid Principal Balance at Origination**	The face value of the note at origination (i.e., the amount borrowed by the mortgagor). Report 2 decimals.	Number(2)	Greater than 0 and less than or equal to 10 million
I	**Amortization Term at Origination**	The number of months between the scheduled first payment due date and the maturity date of the mortgage, expressed in months. Provide the term at the origination of the loan, before any modification occurred.	Integer	Optional -Greater than 0
J	**Interest Rate at Origination**	The interest rate of the loan at origination. Report 5 decimals.	Percent(5)	Optional -Greater than 0 and less than or equal to 25.00000%
K	**LTV at Origination (1st Lien only)**	The ratio between the original loan amount and the lesser of the sales price or the appraised value, for first mortgages.	Percent(5)	Optional -Greater than 0 and less than or equal to 150.00000%.
L	**Product before Modification**	The mortgage product of the loan, based on the contractual mortgage loan terms. For a loan with HAMP Tier 1 permanent modification terms, enter 2) Fixed Rate.	Enumerated List[6]	Must be a valid product type code from the list. 1- ARM, 2 - Fixed Rate, 3 - Step Rate, 4 - One Step Variable, 5 - Two Step Variable, 6 - Three Step Variable, 7 - Four Step Variable, 8 - Five Step Variable,9 - Six Step Variable, 10 - Seven Step Variable,11 - Eight Step Variable, 12 - Nine Step Variable,13 - Ten Step Variable, 14 - Eleven Step Variable, 15 - Twelve Step Variable, 16 - Thirteen Step Variable, 17 – Fourteen Step Variable Numeric(4,0)

[6] For FRM-IO: enter Product Before Modification as 1. Enter the current interest rate in the field M (Next ARM Reset Rate). Enter the payment reset date (the date that the FRM IO will begin to amortize) in the field N (Next ARM Reset Date).

Column	Label	Data Dictionary	Field Type	Field Validation
M	**Next ARM Reset Rate**	The expected interest rate on an ARM loan at the next ARM reset date given the reset date is within the next 120 days. Use the latest available reset rate at the time of submission. If the reset date is outside of 120 days, then use note rate before modification. Report 5 decimals.	Percent(5)	Conditionally required – ARM/IO product types only. Greater than 0 and less than or equal to 25.00000%
N	**ARM Reset Date**	The date on which the next ARM reset is due to occur.	Date	Conditionally required – ARM/IO product types only. Valid date greater than 02/02/2009
O	**Remaining Term (# of Payment Months Remaining)**	Scheduled remaining term of the loan in months as of the Data Collection Date. For a loan that was not previously modified (which includes a HAMP Tier 1 trial period plan default), Remaining Term is equivalent to the amortization term minus the time since the first payment after origination to the date that the payment information (i.e., UPB) was obtained; regardless of months delinquent. Example: First payment date for a 360-month term loan was 5/1/08. The pre-mod payment information (i.e., UPB) was reported as of 4/30/09. Remaining term for this loan is (360-12 = 348). For a loan with HAMP Tier 1 permanent modification terms, it is equivalent to the number of months between Data collection Date and the maturity date of the modification, regardless of months delinquent. Example: Maturity date of the loan is 6/1/2018 and the Data Collection Date is 8/1/2014. Remaining term for the loan is 46 months.	Integer	Greater than 0
P	**Unpaid Principal Balance Before Modification**	The unpaid principal balance of a loan for either tier is the contractual UPB based on the existing mortgage loan terms as of the Data Collection date. Do not include arrearage.	Number(2)	Greater than 0

Column	Label	Data Dictionary	Field Type	Field Validation
Q	**Interest Rate Before Modification**	The interest rate on the loan before the modification. Enter the contractual interest rate as of the Data Collection Date. For non-ARM loans with a scheduled rate step pending within 120 days (e.g., HAMP Tier 1 Modifications approaching 5 year anniversary), enter the interest rate at the next scheduled rate step. Report 5 decimals.	Percent(5)	Greater than 0 and less than or equal to 25.00000%
R	**Principal and Interest Payment Before Modification**	The sum of the contractual principal and interest payments before modification for the property under evaluation. If the loan is an IO loan in the interest only period, enter only the interest amount. If the loan is a neg-am, enter the payment amount received (without escrow) at the most recent payment date. For delinquent ARMs, the pre-mod scheduled payment should be reported, not the payment at the LPI date. For non-ARM loans with a scheduled rate step pending within 120 days (e.g., HAMP Tier 1 Modifications approaching 5 year anniversary), enter the P&I amount for the next scheduled rate step. Report 2 decimals.	Number(2)	Greater than 0
S	**Current Borrower Credit Score**[7]	The current credit score of the borrower.	Integer	Greater than or equal to 250 and less than or equal to 900.
T	**Current Co-borrower Credit Score**	The credit score of the co-borrower. If not applicable, leave blank.	Integer	Conditionally required – Loans with co-borrowers. Greater than or equal to 250 and less than or equal to 900
U	**Property - Zip Code**	The five digit zip code of the property.	Integer	5 digits

[7] Credit score variable is based on FICO® scores. Users of other credit scoring systems must transform the mean and the standard derivation of that credit score to put it on a comparable scale to FICO.

Column	Label	Data Dictionary	Field Type	Field Validation
V	**Property - State**	The two letter state code of the property.	Enumerated List[8]	Must be a valid state code from the list: AK, AL, AR, AZ, CA, CO, CT, DC, DE, FL, GA, GU, HI, IA, ID, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OK, OR, PA, PR, RI, SC, SD, TN, TX, UT, VA, VI, VT, WA, WI, WV, WY
W	**Association Dues/Fees Before Modification**	The monthly HOA or condo fees for the property under evaluation; also include any future monthly escrow shortage. Additionally, a borrower who is seeking a modification on a primary residence, and has been displaced and is paying rent on a residence that he or she does not own, the servicer should enter such rent figures in this field. Report 2 decimals.	Number(2)	Greater than or equal to 0
X	**Monthly Hazard and Flood Insurance**	The monthly hazard and flood insurance coverage amount for the property under evaluation. Report 2 decimals	Number(2)	Greater than or equal to 0
Y	**Monthly Real Estate Taxes**	The monthly real estate taxes for the property under evaluation. Report 2 decimals	Number(2)	Greater than or equal to 0
Z	**MI Coverage Percent**	Current non-investor primary mortgage insurance coverage percentage. Report 5 decimals.	Percent(5)	Greater than or equal to 0 and less than or equal to 100.00000%
AA	**Property Valuation As-is Value**	The property value collected through an AVM, BPO, or appraisal for the property under evaluation. Report 2 decimals.	Number(2)	Greater than or equal to 10

[8] Note that DC is in the code, but is not a state; PR is in the code and is a commonwealth; Northern Mariana Islands is a commonwealth but not in the code; American Samoa is a territory and is not in the code; Guam and the Virgin Islands are territories and are in the code.

Column	Label	Data Dictionary	Field Type	Field Validation
AB	**Mark-to-Market LTV**	UPB before modification divided by property valuation as-is value. Truncate the value to 5 decimal places. Do not round. For example, for MTMLTV =66.666612%, truncate the value to 5 decimal places and report 66.66661%. If you are pasting the value, it should be 0.6666661. Another example, for MTMLTV =79.999998%, truncate the value to 5 decimal places and report 79.99999%. If you are pasting the value, it should be 0.7999999.	Percent(5)	Optional -Greater than or equal to 0 and less than or equal to 999.99999%
AC	**Months Past Due**	A loan would be considered past due (delinquent) if the payment had not been received by the end of the day immediately preceding the loan's next due date (generally the last day of the month which the payment was due). For example: a loan with a last paid installment date of 7/1/02 and a due date of 8/1/02, for which no payment was received by the Data Collection Date of 9/1/02, the loan would be reported as one (1) month past due.	Integer	Greater than or equal to 0
AD	**Advances/Escrow**	Required escrow advances already paid by the servicer and any required escrow advances from the servicer that are currently due and will be paid by the servicer during the Trial Period. Report 2 decimals.	Number(2)	Optional -Greater than or equal to 0
AE	**Borrower's Total Monthly Obligations**	Total monthly expenses as reported by the borrower. Report 2 decimals.	Number(2)	Optional -Greater than 0; cannot be less than the total of monthly mortgage payment before modification (sum of field R, W,X,Y)
AF	**Monthly Gross Income**	Total monthly gross income as reported by the borrower and verified by the servicer. For evaluation of a non-owner-occupied property, exclude the rental income from the property under evaluation from the Monthly Gross Income. If there is income from additional rental properties, include the net income from these additional properties in the Monthly Gross Income. Net income from rental properties is calculated as 75% gross rental income minus PITIA. Report 2 decimals.	Number(2)	Greater than or equal to 0

Column	Label	Data Dictionary	Field Type	Field Validation
AG	**Imminent Default Flag**	If a current or 30-day delinquent borrower is considered in imminent default, then this flag receives the value "Y." Otherwise, it receives the value "N." For non-owner occupied, the loan must be in Default; Imminent Default Flag should be N.	Character (Boolean)	Y/N
AH	**Discount Rate Risk Premium**	The rate at which the discount rate is greater than the Freddie Mac Primary Mortgage Market Survey (PMMS) weekly rate for the 30-year conforming loan. The default value is 0. However, a servicer can override the default rate and add up to 250 bps. No premium (Enter 0) for Fannie and Freddie loans. Report 5 decimals.	Percent(5)	Greater than or equal to 0 and less than or equal to 2.50000%
AI	**Modification Fees**	Fees that will be reimbursed by the investors, including notary fees, property valuation, and other required fees. Report 2 decimals.	Number(2)	Conditionally Required – If fees exist for reimbursement. Greater than or equal to 0
AJ	**MI Partial Claim Amount**	Amount paid by the MI at the time of the modification. Report 2 decimals.	Number(2)	Greater than or equal to 0
AK	**Unpaid Principal Balance After Modification (Net of Forbearance & Principal Reduction)**	UPB prior to the modification (HAMP Tier 1) plus interest arrearage, taxes, insurance, HOA amounts, and other costs capitalized at the time of the modification, less forbearance and any principal reduction amounts. This should be calculated assuming the modification starts from the Data Collection Date. Report 2 decimals.	Number(2)	Conditionally required if Occupancy Eligibility = 1 Owner-Occupied - Greater than or equal to 0
AL	**Interest Rate After Modification**	The interest rate on the loan in the month after modification (HAMP Tier 1). This should be calculated assuming the modification starts from the Data Collection Date. Report 5 decimals.	Percent(5)	Conditionally required if Occupancy Eligibility = 1 Owner-Occupied - Greater than 0 and less than or equal to 25.00000%.
AM	**Amortization Term After Modification**	The amortization period of the loan after modification (HAMP Tier 1). This should be calculated assuming the modification starts from the Data Collection Date. Reported in months. This period includes the term extension as defined in the HAMP modification waterfall.	Integer	Conditionally required if Occupancy Eligibility = 1 Owner-Occupied - Greater than 0
AN	**Principal and Interest Payment after Modification**	The sum of the principal and interest payments in the month after the modification (HAMP Tier 1). This should be calculated assuming the modification starts from the Data Collection Date. Report 2 decimals.	Number(2)	Conditionally required if Occupancy Eligibility = 1 Owner-Occupied - Greater than 0

Column	Label	Data Dictionary	Field Type	Field Validation
AO	**Principal Forbearance Amount**	The amount of principal forbearance applied at the modification (HAMP Tier 1). This should be calculated assuming the modification starts from the Data Collection Date. Report 2 decimals.	Number(2)	Conditionally required if Occupancy Eligibility = 1 Owner-Occupied - Greater than or equal to 0, less than or equal to Capitalized UPB Amount
AP	**Principal Forgiveness Amount**	The amount of principal forgiveness applied at the modification (HAMP Tier 1). This should be calculated assuming the modification starts from the Data Collection Date. Report 2 decimals.	Number(2)	Conditionally required if Occupancy Eligibility = 1 Owner-Occupied - Greater than or equal to 0, less than or equal to Capitalized UPB Amount
AQ	**Property Valuation Type**	A code that denotes the type of estimate of the value of the real estate property.	Enumerated List	1 – AVM 2 – Exterior BPO / Appraisal (as is value) 3 – Interior BPO / Appraisal (as is value)
AR	**NPV Date**	Date that the loan is evaluated for trial modification eligibility for the first time. Use today's date if submitting the loan for the first time. This date must stay constant for all future re-runs.	Date	Valid date must be greater than or equal to 4/15/09 but not after today's date
AS	**PRA Waterfall - Unpaid Principal Balance After Modification (Net of PRA Forbearance & PRA Principal Reduction)**	**Principal Reduction Alternative (PRA) Waterfall HAMP Tier 1 -** UPB prior to the modification plus interest arrearage, taxes, insurance, HOA amounts, and other costs capitalized at the time of the modification, less PRA forbearance and any PRA principal reduction amounts. This should be calculated assuming the modification starts from the Data Collection Date. Report 2 decimals.	Number(2)	Conditionally Required - If Occupancy Eligibility =1 and post-arrearage MTMLTV >115% or if PRA Waterfall-Principal Forgiveness >0. Greater than or equal to 0
AT	**PRA Waterfall - Interest Rate After Modification**	**Principal Reduction Alternative (PRA) Waterfall HAMP Tier 1 -** The interest rate on the loan in the month after modification. This should be calculated assuming the modification starts from the Data Collection Date. Report 5 decimals.	Percent(5)	Conditionally Required - If Occupancy Eligibility =1 and post-arrearage MTMLTV >115% or if PRA Waterfall-Principal Forgiveness >0. Greater than 0 and less than or equal to 25.00000%.
AU	**PRA Waterfall - Amortization Term After Modification**	**Principal Reduction Alternative (PRA) Waterfall HAMP Tier 1 -** The amortization period of the loan after modification. This should be calculated assuming the modification starts from the Data Collection Date. Reported in months. This period includes the term extension as defined in the HAMP modification waterfall.	Integer	Conditionally Required - If Occupancy Eligibility =1 and post-arrearage MTMLTV >115% or if PRA Waterfall-Principal Forgiveness >0. Greater than 0

Column	Label	Data Dictionary	Field Type	Field Validation
AV	**PRA Waterfall - Principal and Interest Payment after Modification**	**Principal Reduction Alternative (PRA) Waterfall HAMP Tier 1-** The sum of the principal and interest payments in the month after the modification. This should be calculated assuming the modification starts from the Data Collection Date. Report 2 decimals.	Number(2)	Conditionally Required - If Occupancy Eligibility =1 and post-arrearage MTMLTV >115% or if PRA Waterfall-Principal Forgiveness >0. Greater than 0
AW	**PRA Waterfall - Principal Forbearance Amount**	**Principal Reduction Alternative (PRA) Waterfall HAMP Tier 1 -** The amount of principal forbearance applied at the modification. This should be calculated assuming the modification starts from the Data Collection Date. Report 2 decimals.	Number(2)	Conditionally Required – If Occupancy Eligibility =1 and post-arrearage MTMLTV >115% or if PRA Waterfall-Principal Forgiveness >0. Greater than or equal to 0, less than or equal to Capitalized UPB Amount
AX	**PRA Waterfall - Principal Forgiveness Amount**	**Principal Reduction Alternative (PRA) Waterfall HAMP Tier 1 -** The amount of principal forgiveness applied at the modification. This should be calculated assuming the modification starts from the Data Collection Date. Report 2 decimals.	Number(2)	Conditionally Required – If Occupancy Eligibility =1 and post-arrearage MTMLTV >115%. Greater than or equal to 0, less than or equal to Capitalized UPB Amount
AY	**Maximum Months Past Due in Past 12 Months**	Maximum Months Past Due during the 12 Month period prior to the data collection date.	Integer	Conditionally Required – If post-arrearage MTMLTV > 115% or if PRA Waterfall-Principal Forgiveness>0. Greater than or equal to Months Past Due (Column AC).

Column	Label	Data Dictionary	Field Type	Field Validation
AZ	**Occupancy Eligibility**	Occupancy status and modification eligibility of the property being evaluated. • **Select 1** for evaluating an owner-occupied property: i) for HAMP Tier 1 and Tier 2 evaluations on or after NPV date 6/1/2012, ii) OR eligible for re-evaluation under HAMP Tier 1 (e.g. due to a change in circumstances), with NPV date prior to 6/1/2012 **Select 2** for any evaluation for a non-owner-occupied property (eligible for Tier 2 evaluation only) **Select 3** for an evaluation of an owner-occupied property that has no change in circumstance; and was previously deemed i) excessive forbearance or ii) with pre-mod DTI less than 31%; ii) or, with an HAMP Tier 1 NPV negative result (eligible for Tier 2 evaluation only) **Select 4** for evaluating: i) a loan that has defaulted under the HAMP Tier 1 trial period plan or HAMP Tier 1 permanent modification , ii) or a HAMP Tier 1 permanent modification (eligible for Tier 2 evaluation only)	Enumerated list	Required- 1- Owner-occupied 2- Non- owner-occupied 3- Owner-occupied Excessive Forbearance/Pre-mod Front-end DTI<31%/Prior HAMP NPV Negative 4- Owner-occupied HAMP Tier 1 trial period plan default, or HAMP Tier 1 permanent modification (regardless of current status).
BA	**Capitalized UPB Amount**	UPB including all capitalization (Refer to MHA Handbook for waterfall step 1-capitalization). UPB should be as of the Data Collection Date. Servicer should NOT project or estimate the amount as of a future date. Report 2 decimals.	Number(2)	Required - Greater than or equal to the UPB before Modification.less one full contractual payment
BB	**Tier 2 Non-PRA Forgiveness Amount**	If the investor elects to forgive principal under the Tier 2 standard waterfall. This is not Tier 2 PRA. This forgiveness will not be incented. Report 2 decimals.	Number(2)	Optional – Greater than or equal to 0, less than or equal to Capitalized UPB Amount

Column	Label	Data Dictionary	Field Type	Field Validation
BC	**Tier 2 Investor Override Flag**	If there are any investor guidelines or applicable laws that restricts the terms of a modification under Tier 2, select Y; otherwise, select N. If Y is selected, at least one of the four override fields (Fields BD, BE, BF, BG) must be populated.	Character(Boolean)	Required Y/N
BD	**Tier 2 Mod Interest rate Override**	If there are investor guidelines or applicable laws that restricts the interest rate for a modification, provide value here. If rate reduction or increase is not allowed, enter the interest rate before modification. The interest rate provided in this field will be used in the Tier 2 Waterfalls and Tier 2 Mod Rate Results. Report 5 decimals.	Percent(5)	Optional - Greater than 0 and less than or equal to 25.00000%.
BE	**Tier 2 Mod Term Override**	If there are investor guidelines or applicable laws that restricts the amortization term of a modification, provide value here. If term extension is not allowed, enter the remaining term. The term provided in this field will be used in the Tier 2 Waterfalls and Tier 2 Mod Term Results.	Integer	Optional - Greater than or equal to remaining term and less than or equal to 600.
BF	**Tier 2 Mod Forbearance Amount Override**	If there are investor guidelines or applicable laws that restricts the forbearance amount for a modification, provide value here. If forbearance is not allowed, enter 0. The forbearance amount provided in this field will be used in the Tier 2 Waterfalls and Tier 2 Mod Forbearance Amount Results. Report 2 decimals.	Number(2)	Optional - Greater than or equal to 0, less than or equal to Capitalized UPB Amount
BG	**Tier 2 PRA Principal Forgiveness Override**	If the investor elects to forgive principal under Tier 2 PRA in an amount other than what is calculated by the model, provide value here. The forgiveness amount provided in this field will be used in the Tier 2 PRA Waterfall and Tier 2 PRA Principal Forgiveness Amount Results. Report 2 decimals.	Number(2)	Optional - Greater than or equal to 0, less than or equal to Capitalized UPB Amount
BH	**Primary Residence Total Housing Expense**	For the non-owner-occupied property under evaluation, the total monthly housing expense for the borrower's primary residence. This includes the PITIA only. Report 2 decimals.	Number(2)	Conditionally required if Occupancy Eligibility = 2 -Greater than or equal to 0.
BI	**Property Monthly Gross Rental Income**	For the non-owner occupied property under evaluation, the monthly gross rental income received from the property before any cost or expenses. Report 2 decimals.	Number(2)	Conditionally required if Occupancy Eligibility = 2 -Greater than or equal to 0.

The Servicer Defined Inputs (columns AH-AJ from the table above) are prescribed as follows:

- **Discount Rate Risk Premium** – The default value is the weekly Freddie Mac Primary Mortgage Market Survey (PMMS) weekly rate for 30-year fixed-rate conforming loans. The servicer can override the default discount rate by adding a risk premium of no more than 250 basis points to the PMMS weekly rate subject to the following constraints:
  - With respect to non-GSE loans, the servicer may apply a maximum of two discount rates: one for loans in its own portfolio, and another for loans serviced for investors. The discount rate risk premium applied to loans in the servicer's portfolio must be less than or equal to the discount rate risk premium applied to loans in investor portfolios.
  - With respect to loans owned or guaranteed by Fannie Mae or Freddie Mac, the servicer must follow Fannie Mae and Freddie Mac guidance.
  - When performing loan-level NPV calculations, the discount rate must be applied consistently to all cash flows. This means that the discount rate applied to cash flows of unmodified loans must be the same as that applied to the cash flows of modified loans.
- **Modification Fees** – Fees that will be reimbursed by the investors, including notary, property valuation, and other required fees.
- **MI Partial Claim Amount** – This is the amount the MI company agrees to pay subsequent to a negative NPV and MI insurer review, if the choice is made.

Guidance for Inputs in Special Scenarios

These scenarios require the model user to pay special attention to ensure the use of appropriate entry of model inputs.

- To evaluate non-ARM or non-IO loans scheduled interest rate step pending within 120 days (i.e. HAMP Tier 1 modifications with step rate), use the monthly mortgage payment and interest rate that will be in effect at the time of the reset.
  - L - Product Before Modification: Fixed Rate
  - Q – Interest Rate Before Modification: enter the interest rate at the next scheduled rate step.
  - R – Principal and interest Payment Before Modification: Enter the P&I amount of the next scheduled rate step.
  - AZ – Occupancy Eligibility: Enter '4'

Base NPV Model Assumptions

- **Timing of NPV Cash flow** – All loans that meet HAMP eligibility must be evaluated using the NPV model prior to becoming a permanent modification. At the time of the NPV run, servicers do not know the exact length of the trial period or the exact start date of the trial. For that reason, the NPV model makes a simplifying assumption that the cash flows start at the Data Collection Date (as of date for UPB, remaining term etc). All "after modification" waterfall terms refer to the period after the Data Collection Date. The waterfall terms should be calculated using capitalized UPB as of the Data Collection Date.
- **Current Market Rate –** Freddie Mac's PMMS weekly rate for 30-year fixed-rate conforming loans.
- **Servicing Fee Strip from Investor Cash flow** – HAMP NPV v3.0 did not remove servicer fees from the note rate[9] and assumed that the entire interest amount paid by the borrower is passed through to the investor. Since NPV v4.0, servicing fees have been taken into account so that servicers receive an IO strip of 25 bps for FRM loans and 37.5 bps for ARM loans.

  To illustrate, suppose an FRM loan with an interest rate of 6% and a pre-mod UPB of $100,000. The pre-mod interest payment on this loan is $100,000*(0.06/12) = $500. Deducting a 25 bp servicing fee, the interest payment to the investor will be $100,000*(0.0575/12) = $479.17. Note that the principal payment passed through to the investor is unaffected by this deduction. The discount rate in the base NPV model is based on a weekly survey of mortgage rates (Freddie Mac PMMS). The surveyed rates do not subtract out the servicing strip. As such, in order to re-align the note rate and the discount rate, the discount rate will be lowered by 25 bps.

- **Probability of Default/Re-default Rate –** See the Base Model Equations section, below. The re-default rates on modified loans will vary with a number of parameters particular to the loan. In general, however, the re-default rate is assumed to vary based on five key indicators:
  - current credit score;
  - MTMLTV of the home at the time of modification;
  - months past due (earlier or later in the delinquency cycle); and
  - front-end DTI ratio before and after modification; and
  - occupancy (owner-occupied or non-owner-occupied)

  The default/re-default rate model will be updated over time as more information becomes available.
- **Time to Re-default –** The base NPV model assumes that those loans that do fail after modification will become delinquent six months after the initiation of the trial period and subsequently default.

[9] Note rate is the Interest Rate before Modification

- **Prepayment Rate –** See the Base Model Equations section for detailed information on the prepayment model. The prepayment rate for loans with modification or without modification is calculated based on a variety of parameters. The key variables are:
  - MTMLTV for each period the prepayment rate is estimated;
  - Home price growth in the previous 12 months for each period the prepayment rate is estimated;
  - Current credit score;
  - Original loan amount;
  - Refinance incentive
- **ARM/IO Reset or Recast *(Used to calculate DTI for eligibility, incentives and waterfall)* –** ARMs and IO loans with a payment scheduled to reset or recast in the next 120 days (from the data collection date) will be based on the reset payment. This base NPV model simplifies the interest rate assumption per the following terms:
  - If the ARM/IO loan will not reset or recast in next 120 days, use the pre-mod monthly payment, which is the "Principal and Interest Payment before Modification" input field.
  - If the ARM/IO loan will reset or recast in next 120 days:
    - For non-GSE loans, amortize the loan using the reset interest rate, pre-mod UPB, and the remaining term.
    - For GSE loans, use the pre-mod monthly payment, which is the "Principal and Interest Payment before Modification" input field.
- **Par Value Approach *(Used for No Mod Cure Cash Flow)*** – Due to the difficulty of predicting future interest rate paths for adjustable rate mortgages, we are making a simplifying assumption to calculate the cash flows by using a par value approach. This will only apply to the no mod cure cash flow for all loans except fixed-rate mortgages. This includes interest-only loans (adjustable-rate and fixed-rate), and option-ARM loans. We set the present value of the cash flow equal to P&I arrearage plus UPB.

- **REO Valuation using an Automated Valuation Model (AVM)**
  - Properties sold as REO generally sell at a lower value than non-distressed properties; this is a result of the deterioration in value that often occurs as a home goes through the foreclosure process. During the modification process, an AVM or other property valuation which reflects a non-foreclosure value is used. Therefore, this value must be discounted in order to determine what an investor can expect to recoup as a result of the property sale after foreclosure.
  - Prior to Base NPV v4.0, the model used a state-varying REO discount that is proportional to the estimated value of the home. The REO discount reflects the deterioration in value that often occurs as a home goes through the foreclosure process. Homes with estimated values below $100,000 have higher REO discount rates than loans with estimated values above $100,000. This method does not account for fixed costs associated with REO transactions. This omission disadvantages very low-value homes whose REO value may in fact be zero.
  - Base NPV Model v4.0 and subsequent versions include: (1) An additional low-balance category for property valued below $50,000; and (2) intercepts for all

loan categories: property valued below $50,000, property valued between $50,000 and $100,000 and property valued over $100,000. Beginning with v4.0, the REO discount structure changes from estimating an "REO discount" to estimating the REO sale value. The REO sale value will have a lower bound of zero. The estimation was based on AVM values, but the same equation will be used for interior/exterior broker price opinions (BPOs) and appraisals, with a subsequent adjustment for their higher accuracy (see next section for details).

– The specification for estimating REO sale value of the property for each state:

$$REO_s = \beta_{0s} + \beta_{1s} * I_{PropValue \leq \$50k} + \beta_{2s} * I_{\$50k < PropValue \leq \$100k} + \beta_{3s} * PropValue + \beta_{4s} * PropValue * I_{VPropValue \leq \$50k} + \beta_{5s} * PropValue * I_{\$50k < PropValue \leq \$100k}$$

where:

REO =the estimated REO Sale Value

$I_{PropValue<\$50k}$ = binary indicator set to 1 if the PropValue is less than or equal to $50K, otherwise set to 0

$I_{\$50k<PropValue<\$100k}$ = binary indicator set to 1 if the PropValue is between $50K up to and including $100k, otherwise set to 0

PropValue = Property Valuation As-Is Value[10] Marked Forward to the estimated Disposition Date[11]

β = coefficient values.

– The coefficient values in the table here are for illustrative purposes only.

– For example, suppose the home located in State 1 has a property value of $26,000[12] as of the expected REO disposition date. Using the example set forth in the table below, the borrower's estimated REO sale value would be: -$12,606 +$7,629.11*1 - $18,262.2*0 + 0.8435*$26,000 - 0.4019*1*$26,000 +0.4510*0 *$26,000= $6,504.

State	Intercept β0s	<=50k indicator β1s	50k<=100k indicator β2s	PropValue β3s	<=50k indicator * PropValue β4s	50k<=100k indicator * PropValue β5s
State 1	-12,606	7,629.11	-18,262.2	0.8435	-0.4019	0.4510

[10] The Property Valuation As-is Value is provided by the servicer and may be obtained through an approved Automated Valuation Model (AVM) such as Freddie Mac's Home Value Estimator (HVE) or Fannie Mae's Automated Property Service (APS), a broker price opinion (BPO), or appraisal. For BPOs and appraisals, the "as is value" should be used.

[11] This is equal to the Property Valuation As-is Value multiplied by the House Price Forecast to give an estimated house price value in the period of the REO Disposition.

[12] This is equal to the current AVM value multiplied by the House Price Forecast to give an estimated house price value in the period of the REO Disposition..

- If the value of the home is $75,00011, then the estimated REO sale value : -$12,606 +$7,629.11*0 - $18,262.2*1 + 0.8435*$75,000 - 0.4019*0*$75,000 + 0.4510*1*$75,000 = $66,219. Similarly, if the value of the home is $200,00011 then the estimated REO sale value is: -$12,606+ $7,629.11*0 - $18,262.2*0+ 0.8435*$200,000 - 0.4019*0*$200,000 + 0.4510*0*$200,000 = $156,094.

- **REO Valuation using Exterior/Interior BPO and Appraisal**

  Servicers can submit an exterior or interior broker price opinion (BPO) or appraisal in lieu of AVM valuation. Because an exterior valuation is presumably more accurate than an AVM valuation, and an interior valuation is presumably more accurate than an exterior valuation, we adjust the REO discount and hence the REO sale value for each valuation type. The REO Discount for the AVM valuation represents the difference between estimated REO Sale Value (from the specification above) and the marked-forward property value at disposition. The measure is expressed as a percentage of the marked-forward AVM sale price. The REO Discount for an exterior valuation will be 75% of the AVM discount. The REO Discount for an interior valuation will be 25% of the AVM discount.

  For example, consider a current exterior valuation at $180,000. After marking the value forward to the estimated disposition date, the marked-forward property value is $200,000. Using the specification above, the estimated REO sale value is $156,094 (see above for calculation details). We can then back-out the AVM discount; it is calculated to be 21.95%= (($200,000 -$156,094) /$200,000). Since this is an exterior valuation, the actual REO discount should be 16.46% (=0.75*21.95%). From here, the adjusted REO sale value would be $167,070.5 =($200,000 * (100%-16.46%)).

  Beginning with v5.0, a non-state-dependent fixed discount factor will also be multiplied to the adjusted REO sale value to account for the difference between owner-occupied and non-owner-occupied properties.

- **Home Price Projection**

A 110 local market (MSA or non-MSA regions) home price projection is used for all home-price related calculations. The projection is based on an autoregressive model using the previous four quarters' data. We used data from all Fannie Mae and Freddie Mac mortgage transactions, and data from outside vendors including deed transactions associated with many jumbo loans, loans in private-label securities, government loans, and loans held by lenders in portfolio. The projections are updated quarterly with new data, and the models supporting the projections may be updated to improve their accuracy. Unlike the FHFA House Price Index, this home price projection includes non-GSE transactions. Projections are based on both long- and short-term trends. The assumption is that prices tend to return to their long-term trends and that short-term trends continue, but at a diminishing rate. Beginning 2009Q3, the home price index (history and projection) has been adjusted to remove the seasonal affects of home prices and reduce the index's impact on the Home Price Decline Protection Payment. Beginning August 1, 2013, the home price projections are based on an autoregressive model

using the previous four quarters' data. In addition, upper and lower bounds based on each region's historical home price growth are applied to reduce variability.

- **Foreclosure, REO, and Disposition Timing and Costs**
  - Foreclosure timeline data is calculated on all GSE defaults (including pre-foreclosure sales, third-party sales, REO, and all other cases) that had their liquidation date in the preceding four quarters. Foreclosure timeline extends from the date of last paid installment date (LPI) to loan liquidation date.
  - REO timeline data is calculated on all GSE REO disposed as direct sales in the preceding four quarters. Borrower redemptions, lender repurchases, etc., are not included in the REO timeline calculation, but auctions and bulk sales do count as direct sales. The REO timeline begins at the REO acquisition date and ends at the REO disposition date, and includes any redemption periods or other periods that may delay sale of the property.
  - Foreclosure & REO costs are calculated based on GSE REO cases in the preceding four quarters on a weighted-average basis for each state. Settlement costs are calculated based on GSE REO direct sale cases only in the preceding four quarters on a weighted-average basis for each state. Costs are calculated excluding all taxes, large repairs (greater than $3,000) that would significantly change a property's value, homeowners' insurance premiums, homeowners' association fees, and condominium fees. (These expenses are dealt with separately in the base NPV model framework).

    1. Foreclosure & REO costs are the sum of:
       a. Attorney and Trustee Fees
       b. Possessory and Eviction Fees and Expenses
       c. Bankruptcy Expenses
       d. Servicer Liquidation Expenses
       e. MI Premium
       f. Flood Insurance Premium
       g. Title Insurance
       h. Appraisal Fees
       i. Property Inspection
       j. Utilities
       k. Property Maintenance/Preservation
       l. Other Foreclosure and Holding Costs
       m. Total Repairs (capped at $3,000 to exclude discretionary repairs)
       n. Participation Expenses
       o. Foreclosure Costs that are paid out at property sale (from HUD-1)

    Calculation: Weighted average of ([Sum of costs "a" through "o" above] / Loan UPB at Default), with the weight on the UPB at default.

    2. Settlement Charges are the sum of:
       a. Discount Points

b. Loan Origination Fees
c. Broker's Bonus
d. Broker Commission Fees
e. Buyer's Closing Costs (paid by seller only—not total buyer's closing costs)
f. Title Fee Cost
g. Seller's Closing Costs
h. Assessments
i. FHA/VA Non-Allowable Costs
j. Other Costs
k. Wire Fees
l. Subtract miscellaneous revenues received at property sale:
    i. Per diem amount
    ii. Other rent/interest amount
    iii. Prepaid interest amount

Calculation: Weighted average of ([Sum of costs "a" through "l" above] / Gross Sale Price), with the weight on the Gross Sale Price.

Note: The "foreclosure costs" on the HUD-1 document are paid out at property sale. That value is included in the calculation of the Foreclosure & REO costs rather than Settlement Charges. Although they are paid at the property sale, they are conceptually part of the Foreclosure & REO costs category.

Base NPV Model Outputs

The Base NPV model produces two types of output – Waterfall Tests and NPV Results. The Waterfall Test is an indicator to the servicer as to whether the modification terms fall within the guidelines of HAMP Tier 1. The terms of the modification proposed by the Portal are not provided in the output. The NPV Results display the total expected cash flows of the modification scenario and the no-modification scenario.

1. Waterfall Tests
    - **Waterfall Test (Y/N) –** The Waterfall Test compares the modified loan terms and forbearance provided by the servicer with those calculated by the NPV model. The result of the Waterfall Test does not attest to whether the terms of the modification follow the HAMP waterfall guidelines, nor does it attest to whether the terms of the modification violate the standard waterfall guidelines. Because certain nuances may exist in the interpretation and implementation of the waterfall guidelines, this flag is simply informational. It is the responsibility of the servicer to make sure the terms of the modification follow HAMP guidelines.

For the test, the code checks that the waterfall outputs are within the following range:

- Interest Rate After Modification must be within 12.5 basis points of the interest rate calculated by the Base NPV model.
- Amortization Term After Modification must be within 12 months of the term calculated by the Base NPV model. If the pre-mod remaining term is greater than 480 months, the Amortization Term After Modification must equal the pre-mod remaining term.
- Forbearance amount must be within $1,000 of the amount calculated by the Base NPV model.

Effective since v4.03, the Waterfall Test has included an out-of-sequence operation in the Waterfall Test, not accounting for investor restrictions:

- If maturity date of the loan is extended, Interest Rate After Modification must be reduced to the lesser of 2% or Interest Rate before Modification
- If Principal Forbearance is granted, Interest Rate After Modification must be reduced to the lesser of 2% or Interest Rate before Modification, and Amortization Term After Modification must be extended to the maximum of 480 or pre-mod remaining term.

- **PRA Waterfall Test (Y/N) –** The Principal Reduction Alternative (PRA) Waterfall Test compares the modified loan terms, forbearance and forgiveness (under the PRA Waterfall) provided by the servicer with those calculated by the Base NPV model. The result of the Waterfall Test does not attest to whether the terms of the modification follow the HAMP waterfall guidelines, nor does it attest to whether the terms of the modification violate the PRA waterfall guidelines. Because certain nuances may exist in the interpretation and implementation of the waterfall guidelines, this flag is simply informational. It is the responsibility of the servicer to make sure the terms of the modification follow the HAMP guidelines.

  For the Waterfall Test, the code checks that the PRA waterfall outputs are within the following range:

  - PRA Principal Forgiveness Amount, at a minimum, either reduces the front-end DTI to 31% or MTMLTV to 115%
  - PRA-Interest Rate After Modification must be within 12.5 basis points of the interest rate calculated by the Base NPV model.
  - PRA-Amortization Term After Modification must be within 12 months of the term calculated by the Base NPV model. If the pre-mod remaining term is greater than 480 months, then the Amortization Term After Modification must equal pre-mod remaining terms.
  - PRA-Forbearance Amount must be within $1,000 of the amount calculated by the Base NPV model.

Since v4.03, the Waterfall Test has included an out-of-sequence operation in the PRA waterfall check:

- If maturity date of the loan is extended, then PRA - Interest Rate After Modification must be reduced to the lesser of 2% or Interest Rate before Modification.
- If PRA - Principal Forbearance is granted, then PRA - Interest Rate After Modification must be reduced to the lesser of 2% or Interest Rate before Modification, and PRA-Amortization Term After Modification must be extended to maximum of 480 or pre-mod remaining term.

- **De Minimis (Y/N) –** Whether the loan meets the "de minimis" test to qualify for annual servicer and borrower Pay-for-Performance Payments – at least 6% reduction in monthly PITIA payment.
- **Forbearance Flag (Y/N) –**This flag is no longer in use per the MHA Handbook. Users have seen a dash (-) for this field since Base NPV model v4.0.

2. NPV Results

- **HAMP Servicer Loan Number**
- **Servicer Loan Number –** Unique loan number
- **HAMP Value No Mod –** NPV of not modifying the loan
- **HAMP Value Mod –** NPV of modifying the loan under the HAMP standard modification waterfall
- **HAMP NPV Test–** Result of the NPV test (Positive/Negative) under the HAMP standard modification waterfall. Positive means the HAMP Value Mod is greater than or equal to HAMP Value No Mod.
- **NPV Run Successful? –** "Y" or "N" flag indicates whether the loan was able to run through the Base NPV model. The data field is populated with a "Y" flag if the loan runs through the Base NPV model successfully. If the loan does not run through the Base NPV model successfully due to a data error or other issue, the field will be populated with an "N" flag, followed by a code(s) indicating the error. For example, N: 1; 5; d. The list of codes and descriptions is provided below. If the loan is not run through the Base NPV model successfully, the NPV will not be available – please correct the data and resubmit.
- **Run Date –** Date the NPV test was run (This is NOT the input "NPV Date.")
- **Code Version –** The version of the Base NPV model that was used in the assessment, where applicable
- **Freddie PMMS Rate –** The Freddie Mac weekly PMMS rate for 30-year conforming loans used in the NPV calculation.
- **HAMP PRA - Value No Mod –** NPV of not modifying the loan
- **HAMP PRA - Value Mod –** NPV of modifying the loan under the HAMP PRA waterfall
- **HAMP PRA - NPV Test–** Result of the NPV test under the HAMP PRA Waterfall (Positive/Negative). Positive means the HAMP PRA-Value Mod is greater than or equal to HAMP PRA-Value No Mod.

- **TIER2 Principal Forbearance Amount –** The principal forbearance amount under the Tier 2 standard waterfall.
- **TIER2 Non-PRA Principal Forgiveness Amount –** The non-PRA principal forgiveness amount under the Tier 2 standard waterfall.
- **TIER2 Mod Rate -** The interest rate after modification under the Tier 2 standard waterfall.
- **TIER2 Mod Term -** The amortization term after modification under the Tier 2 standard waterfall.
- **TIER2 Mod Payment -** The principal and interest payment under the Tier 2 standard waterfall.
- **TIER2 Mod UPB -** The unpaid principal balance that is net of any forgiveness or forbearance under the Tier 2 standard waterfall.
- **TIER2 Value No Mod –** NPV of not modifying the loan
- **TIER2 Value Mod –** NPV of modifying the loan under the Tier 2 standard waterfall.
- **TIER2 - NPV Test -** Result of the NPV test under the Tier 2 standard modification waterfall (Positive or Negative or Ineligible- DTI or Ineligible-Payment or Ineligible-DTI & Payment).
  - Positive means the TIER2 Value Mod is greater than or equal to TIER2 Value No Mod.
  - Ineligible – DTI means the loan is ineligible for Tier 2 standard modification due to an out-of-range post-modification DTI (NPV Dates on or after February 1, 2013: less than 10% and greater than 55%).
  - Ineligible – Payment means the loan is ineligible for Tier 2 standard modification due to not satisfying the P&I payment change requirement (NPV Dates on or after July 1, 2014: modification must not increase payment).
  - Ineligible – DTI & Payment means the loan is ineligible for Tier 2 standard modification due to an out-of-range post-modification DTI andfailing the P&I payment change requirement.
- **TIER2 PRA Principal Forgiveness Amount -–** The Tier 2 PRA principal forgiveness amount calculated under the Tier 2 PRA waterfall
- **TIER2 PRA Mod Rate -–** The Tier 2 interest rate after modification under the Tier 2 PRA waterfall
- **TIER2 PRA Mod Term -–** The Tier 2 PRA amortization term after modification under the Tier 2 PRA waterfall
- **TIER2 PRA Mod Payment -–** The Tier 2 PRA principal and interest payment under the Tier 2 PRA waterfall
- **TIER2 PRA Mod UPB -–** The unpaid principal balance that is net of any forgiveness under the Tier 2 PRA waterfall
- **TIER2 PRA Value No Mod -** NPV of not modifying the loan
  TIER2 PRA Value Mod - NPV of modifying the loan under the Tier 2 PRA waterfall

- **TIER2 PRA - NPV Test -** Result of the NPV test under the Tier 2 PRA waterfall (Positive or Negative or Ineligible- DTI or Ineligible-Payment or Ineligible-DTI & Payment).
  - Positive means the TIER2 NPV PRA Value Mod is greater than or equal to TIER2 NPV PRA Value No Mod.
  - Ineligible – DTI means the loan is ineligible for Tier 2 PRA modification due to an out-of-range post-modification DTI (NPV Dates on or after February 1, 2013: less than 10% and greater than 55%).
  - Ineligible – Payment means the loan is ineligible for Tier 2 PRA modification due to not satisfying the P&I payment change requirement (NPV Dates on or after July 1, 2014: modification must not increase payment)..
  - Ineligible – DTI & Payment means the loan is ineligible for Tier 2 PRA modification due to both an out-of-range post-modification DTI and failing the P&I payment change requirement.

Codes returned in the "NPV Run Successful?" field when the run is not successful are:

NPV Run Successful? "N" Error Code	DESCRIPTION
1	Invalid or missing Investor Code
2	Missing Servicer Loan Number
3	Missing HAMP Servicer Number
4	Missing Data Collection Date
5	Missing First Payment Date at Origination
6	Missing Unpaid Principal Balance at Origination
7	Error code 7 no longer used
8	Error code 8 no longer used
9	Error code 9 no longer used
10	Invalid or missing Product before Modification
11	Missing Remaining Term
12	Missing Unpaid Principal Balance Before Modification
13	Missing Interest Rate Before Modification
14	Missing Principal and Interest Payment Before Modification
15	Missing Current Borrower Credit Score
16	Missing or non-5 digit Property - Zip Code
17	Missing Property - State
18	Missing Association Dues/Fees Before Modification or Monthly Hazard and Flood Insurance or Monthly Real Estate Taxes
19	Missing Property Valuation As-is Value
20	Error 20 no longer used
21	Missing or less than 0 Months Past Due
22	Missing or negative Monthly Gross Income

NPV Run Successful? "N" Error Code	DESCRIPTION
23	Missing Unpaid Principal Balance After Modification
24	Missing Interest Rate After Modification
25	Missing Amortization Term After Modification
26	Missing Principal and Interest Payment After Modification
27	Invalid or missing Imminent Default Flag
28	Invalid or missing Property Valuation Type
29	Data Collection Date is more than 90 days ago from the NPV Date or is in the future of the NPV Date
30	Unpaid Principal Balance Before Modification is over the allowed maximum for the specified Property – Number of Units
31	Invalid or missing Property - Number of Units
32	First Payment Date at Origination is outside the range of [Jan 1st 1960, Mar 1st 2009]
33	Unpaid Principal Balance at Origination outside the range of (0,$10,000,000]
34	Error 34 no longer used
35	Error 35 no longer used
36	Error 36 no longer used
37	Next ARM Reset rate outside the range of (0,25%]
38	ARM Reset Date is before the First Payment Date at Origination
39	Error 39 no longer used
40	Unpaid Principal Balance Before Modification is less than or equal to 0
41	Interest Rate Before Modification is outside the range of (0,25%]
42	Principal and Interest Payment Before Modification is less than or equal to 0
43	Current Borrower Credit Score/ Current Co-borrower Credit Score is outside the range of [250,900]
44	Property - State is not in list of US states and territories
45	Association Dues/Fees Before Modification or Monthly Hazard and Flood Insurance or Monthly Real Estate Taxes is less than 0
46	MI Coverage Percent is outside the range of [0,100%] or missing
47	Error 47 no longer used
48	Months Past Due is greater than age of the loan
49	Discount Rate Risk Premium is missing or outside the range of [0,2.5%]
50	Modification Fees is less than 0
51	MI Partial Claim Amount is less than 0 or missing
52	Unpaid Principal Balance After Modification is less than 0
53	Interest Rate After Modification is outside the range of (0,25%]
54	Amortization Term After Modification is greater than the maximum of (480 months or the Remaining Term) or Amortization Term After Modification is less than the Remaining Term
55	Error 55 no longer used

NPV Run Successful? "N" Error Code	DESCRIPTION
56	ARM or IO Loan and missing ARM Reset Date
57	ARM or IO Loan and missing ARM Reset Rate
58	Error 58 no longer used
59	Missing NPV Date; or the NPV Date is in the future or before 4/15/09
60	Principal and Interest Payment after modification is less than or equal to 0
61	Principal Forbearance amount is less than 0 or missing or greater than Capitalized UPB amount
62	Principal Forgiveness amount is less than 0 or missing or greater than Capitalized UPB amount
63	Property Valuation as-is Value is less than 10
64	PRA Waterfall - Unpaid Principal Balance After Modification is less than 0 or missing
65	PRA Waterfall - Interest Rate After Modification is outside the range of (0,25%] or missing
66	PRA Waterfall - Amortization Term After Modification is greater than the maximum of (480 months or the Remaining Term) or missing or PRA- Amortization Term After Modification is less than the Remaining Term
67	PRA Waterfall - Principal and Interest Payment after modification is less than or equal to 0 or missing
68	PRA Waterfall - Principal Forbearance amount is less than 0 or missing or greater than Capitalized UPB amount
69	PRA Waterfall - Principal Forgiveness amount is less than 0 or missing or greater than Capitalized UPB amount
70	Maximum Months Past Due in past 12 months is less than 0 or missing or Maximum Months Past Due in past 12 Months is less than Months Past Due
71	Missing GSE Loan Number for GSE loans
72	Tier 2 Interest Rate Override is outside the range of (0,25%]
73	Missing Tier 2 Investor Override flag
74	Tier 2 Forbearance amount Override is less than $0 or greater than the Capitalized UPB amount
75	Tier 2 PRA Forgiveness amount Override is less than 0 or greater than the Capitalized UPB amount
76	Tier 2 Modification Term Override is less than the remaining term or greater than 600 months
77	Missing or negative Primary Residence Total Housing Expense
78	Missing or negative Property Monthly Gross Rental Income or less than $0
79	Tier 2 Non-PRA Forgiveness amount is less than 0 or greater than Capitalized UPB
80	Missing Occupancy Eligibility
a	Ineligible for HAMP modification - Pre-mod DTI already below 31%
b	Monthly Taxes & Insurance and Associations Fees > 31% of Monthly Gross Income

NPV Run Successful? "N" Error Code	DESCRIPTION
c	Error code “c” no longer used
d	Error code “d” no longer used
e	The after mod front-end DTI is greater than the before mod front-end DTI under the Standard Waterfall
f	Error code “f” no longer used
g	Ineligible for HAMP modification - DTI after modification is greater than or equal to 32%
h	Loan has post-arrearage MTMLTV of greater than 115% and is missing at least one PRA Waterfall inputs and/or missing Maximum Months Past Due in past 12 months. Or, has a PRA-Waterfall Forgiveness amount populated and is missing at least one PRA Waterfall inputs and/or missing Maximum Months Past Due in past 12 months.
i	Total Debt in the standard waterfall (sum of UPB after Modification, Principal Forbearance, and Principal Forgiveness) does not equal the total debt in the PRA waterfall (sum of PRA Waterfall – UPB after modification, PRA Waterfall-Principal Forbearance, and PRA Waterfall-Principal Forgiveness)
j	Under the Standard Waterfall, the P&I After Modification provided is inconsistent with the P&I After Modification calculated from the provided UPB after Modification, Interest Rate after Modification, Amortization term after Modification
k	Under the PRA Waterfall, the PRA Waterfall - P&I After Modification provided is inconsistent with the PRA Waterfall -P&I After Modification calculated from the provided PRA Waterfall - UPB after Modification, PRA Waterfall -Interest Rate after Modification, PRA Waterfall -Amortization term after Modification
l	The after mod front-end DTI is greater than the before mod front-end DTI under the PRA Waterfall
m	Ineligible for HAMP modification – Loans that are 0 or 1 month past due but not in imminent default
n	Ineligible for Tier2 Modification – Non-owner-occupied modifications that are less than 2 months past due are not eligible
o	Capitalized UPB provided is inconsistent with the amount calculated from the sum of Unpaid Principal Balance After Modification (Net of Forbearance & Principal Reduction), Principal Forbearance Amount and Principal Forgiveness amount
p	Tier 2 Investor Override Flag is Y and is missing at least one Investor Override fields (Rate, Term, Forbearance, Forgiveness) or Tier 2 Investor Override Flag is N and one of the Investor Override fields is populated
q	Missing Capitalized UPB or Capitalized UPB provided is less than the pre-modification UPB minus one full contractual payment
r	Ineligible for Tier 2 modification – GSE loans with Occupancy Eligibility =2,3 or 4 are ineligible for Tier 2
s	Tier 2 NPV evaluation cannot be run with an NPV date prior to 6/1/2012

V. Base NPV Model Equations

Below we describe the calculations for the no-modification (NPV_{NOMOD}) and modification (NPV_{MOD}) scenarios respectively.

When $NPV_{MOD} > NPV_{NOMOD}$, the modification is said to be NPV positive. Below we describe the calculations for NPV_{NOMOD} and NPV_{MOD} respectively.

Each NPV is calculated as:

$$NPV = (1-p)\times NPV\{Loan\ Cures\} + p \times NPV\{Loan\ Defaults\}$$

where p is the lifetime default probability.[13]

Discounted Future Cash Flows – Four Cases

1. No Mod: NPV{Loan Cures}

In the case where the loan is fixed rate and there is no change in the principal and interest payment over the life of the loan, we calculate the present value using a cash flow model. However, for adjustable-rate loans, interest-only loans (adjustable-rate and fixed-rate), and option ARM loans we take a par value methodology.

Cash Flow Model (Fixed-Rate Mortgage Only)

For each month i, we assume that the full UPB is collected if the loan prepays. If the loan does not prepay, then the investor collects principal and interest. Note that loans that cure may have an arrearage that also must be accounted for. Here we make the simplifying assumption that the P&I arrearage is paid immediately and we approximate the arrearage as:

$$\text{P\&I Arrearage} \approx MDLQ\,(P+I)$$

Hence,

$$PV\{LoanCures\} = \sum_{i=1}^{T} \frac{1}{(1+\delta)^i} \left\{ [\mathrm{UPB_{i-1}} - \mathrm{P_i}][\prod_{k=1}^{i-1}(1-\mathrm{SMM_k}) - \prod_{k=1}^{i}(1-\mathrm{SMM_k})] + [\mathrm{P_i} + \mathrm{I_i}]\prod_{k=1}^{i-1}(1-\mathrm{SMM_k}) \right\} + MDLQ(P_0 + I_0)$$

where:

MDLQ = Months delinquent

T = Remaining term [14]

δ = Monthly discount rate

[13] Default equations are defined at the end of this section.

[14] The remaining term includes the trial period.

UPB = Unpaid principal balance [15]
P = Principal
I = Interest (net of servicing fee)
SMM_k = Single month mortality (SMM) in month k [16]

Par Value Methodology
For ARM loans, IO loans and Option ARM loans we set the present value equal to P&I arrearage plus UPB. Note that the UPB used is the amount after delinquent loans have been cured. [17]

2. No Mod: NPV{Loan Defaults}
The model utilizes a simplified approach to the timing of default. For the no modification scenario, the model assumes that if the loan defaults, it makes no further payments and proceeds to default according to state-level foreclosure (FCL) timelines.

Months to FCL = Max (1, Average State Level FCL timeframe – MDLQ)
S ≡ Months to REO Sales = $^{\text{Months}}$ to FCL + Average State Level REO timeframe [18]

There are two components to this default cash flow: T&I (outflow) and REO sales proceeds (inflow).

$$PV\{LoanDefaults\} = \sum_{j=1}^{S}\left[\frac{-C}{(1+\delta)^{j}}\right] + \frac{NPDV}{(1+\delta)^{S}}$$

where:
C – Taxes and Insurance and Homeowners' Association Fees
NPDV – Net Property Disposition Value

Net Property Disposition Value (NPDV)
We assume that all disposition-related cash flows occur on the date of REO Sale. These include FCL costs, REO disposition costs, MI proceeds, and Net REO Sales proceeds. The components of NPDV are estimated as follows:

a. **Foreclosure/REO Costs –** State-level average costs are used. Note that these are based on the pre-mod UPB before modification.
b. **Settlement Charges –** State-level charges as a percentage of the gross REO sales proceeds, including broker fees.

[15] Note that the notation assumes that UPB_0 is equal to the UPB amount after delinquent loans have been cured.
[16] SMM equations are defined at the end of this section.
[17] It is equal to UPB_0 in the cash flow model above.
[18] For each of the two timeline components we divide the number of days provided in the Foreclosure and REO Disposition Timeline and Costs tables by 30 and set the number of months equal to the next highest integer for both. We then add the two (rounded up) monthly timeline components together to derive S. When converting from S (in months) divide by three and round *down* to the nearest integer.

c. **MI Proceeds** [19, 20] |
   =Min ((MI CoveragePct *UPB*1.15), Max(UPB*1.15 – Net REO Sale Proceeds,0))

d. **Net REO Sale Proceeds –** The estimated sale price of the REO property from the specification (and adjusted by valuation type if applicable) as outlined under the Base NPV Model Assumptions.
   Thus:
   Net REO Sale Proceeds = estimated REO Sale Value * (1-Settlement Charges)

In summary: [21]

NPDV = (Net REO Sale Proceeds) –
Foreclosure/Disposition Costs + MI Proceeds

3. Mod: NPV{Loan Cures}

For each period i the full UPB is collected if the loan prepays. If the loan does not prepay, then the investor collects principal and interest, subsidy and incentives.

$$
\begin{aligned}
PV\{LoanCures\} = &\sum_{i=1}^{T}\frac{1}{(1+\delta)^{i}}\left\{[\mathrm{UPB_{i-1}} - P_i + \mathrm{F_{i-1}}][\prod_{k=1}^{i-1}(1-\mathrm{SMM_k}) - \prod_{k=1}^{i}(1-\mathrm{SMM_k})] + \left[\mathrm{P_i} + [\mathrm{I_i} + \mathrm{GS_i}]\right]\prod_{k=1}^{i-1}(1-\mathrm{SMM_k})\right\} \\
&+ \frac{II_1}{(1+\delta)^{3}}\prod_{k=1}^{2}(1-\mathrm{SMM_k}) + \sum_{j=1}^{6}\left\{\frac{M}{(1+\delta)^{\Psi_{(12*j)}}}\prod_{k=1}^{\Psi_{(12*j)}-1}(1-\mathrm{SMM_k})\right\} \\
&+ \left[\frac{\frac{1}{12}*0.5*HPDP}{(1+\delta)}\right]SMM_1 + \sum_{j=2}^{\Psi_{12}}\left\{\left[\frac{\frac{j}{12}*0.5*HPDP}{(1+\delta)^{j}}\right]SMM_j\left(\prod_{k=1}^{j-1}(1-\mathrm{SMM_k})\right)\right\} \\
&+ \left[\frac{0.5*HPDP}{(1+\delta)^{\Psi_{12}}}\right]\left(\prod_{k=1}^{\Psi_{12}}(1-\mathrm{SMM_k})\right) \\
&+ \sum_{j=13}^{\Psi_{24}}\left\{\left[\frac{\frac{(j-12)}{12}*0.5*HPDP}{(1+\delta)^{j}}\right]SMM_j\left(\prod_{k=1}^{j-1}(1-\mathrm{SMM_k})\right)\right\} + \left[\frac{0.5*HPDP}{(1+\delta)^{\Psi_{24}}}\right]\left(\prod_{k=1}^{\Psi_{24}}(1-\mathrm{SMM_k})\right) \\
&+ \sum_{j=1}^{3}\left\{\frac{A/3}{(1+\delta)^{\Psi_{(12*j)}}}\prod_{k=1}^{\Psi_{12*j}}(1-\mathrm{SMM_k})\right\} + \sum_{j=4}^{\Psi_{36}}\left\{\frac{A}{(1+\delta)^{j}}\Phi_j\, SMM_j\prod_{k=1}^{j-1}(1-\mathrm{SMM_k})\right\} \\
&- Mfee + MIPartialClaim + \left[\frac{F_{\Psi}}{(1+\delta)^{\Psi}}\right]\prod_{k=1}^{\Psi}(1-\mathrm{SMM_k})
\end{aligned}
$$

where:

$$\mathrm{UPB}_i = \mathrm{UPB_{i-1}} - P_i - \iota_i(M) \text{ and } \iota_i(M) = \begin{cases} M & if\ i = 13, 25, 37, 49, 61, 73 \\ 0 & otherwise \end{cases}$$

$\Phi j = 1$ if $j = 4,\ldots,11$; $\Phi j = 2/3$ if $j = 12,\ldots,23$; and $\Phi j = 1/3$ if $j = 24,\ldots,35$.

[19] The servicer may choose to exclude MI coverage with investor consent. The 15% gross-up of UPB approximates accrued interest and foreclosure costs.
[20] For the loan modification case, the relevant UPB will be the post-modification UPB that includes arrears.
[21] We cap the NPDV so that NPDV = Current UPB + MI Proceeds in cases where NPDV > (Current UPB + MI Proceeds).

Ψ = Lesser of T (modification amortization term), or the month when UPB_{i-1} is equal to zero.
Ψ_n = Lesser of n or Ψ

M = Borrower Pay-for-Performance Payment incentive paid for six years in the month after the anniversary of the trial period plan effective date. For the first five years, if a HAMP Tier 1 modification passes the de minimis test, M is the lesser of $1,000 or half the reduction in the borrower's annualized monthly payment to the borrower's 31% DTI payment. It is $0 for HAMP Tier 2. In the sixth year, M is $5,000 for both HAMP Tier 1 and HAMP Tier 2 modifications regardless of the reduction in payment.

GS_i = Payment Reduction Cost Share for Investor

For HAMP Tier 1: $GS_i = 0.5*[\text{Min}(PAY_{DTI=38}, PAY_{DTI\_START}) - PAY_{DTI=31}]$ for $4 \leq i \leq 63$, Otherwise $GS_i = 0$

For HAMP Tier 2: $GS_i = 0.5*[\text{Min}(\text{post-Mod P\&I} - \text{pre-mod P\&I}), (15\% * \text{pre-mod P\&I})]$ for $4 \leq i \leq 63$, Otherwise $GSi = 0$

II_1 = Non-Delinquency Modification Incentive for the Investor = $1,500 if modified loan was current at the beginning of, and throughout, the trial period and the payment is decreased by ≥ 6%. This incentive is only available for HAMP Tier 1 and Tier 2 owner-occupied modifications.

HPDP = Home Price Decline Protection Incentive

Half of the HPDP is allocated for payment 12 months after the start of the trial modification. The other half is allocated for payment 24 months after the start of the trial modification.

If a borrower prepays or loses good standing in the first year after the modification, the HPDP accrued is paid in the month of prepayment or loss of good standing. Similarly, if a borrower prepays or loses good standing in the second year after the modification, the HDPD amount accrued (minus the first year payment disbursed in month 12) is also paid in the month of prepayment or loss of good standing.

HPDP is calculated on the NPV Date at the start of the trial period using the formula:

HPDP = Quintile Base*[1.6*HPD(q–1) + 1.0*HPD(q–2) – 1]*MTMLTV Factor

The Quintile Base is equal to $200, $300, $400, $500 and $600 for loans that fall in quintiles 1, 2, 3, 4 and 5 respectively. Quintile assignment is based on the UPB of the loan prior to modification.[22]

[22] Details on the UPB quintile thresholds are provided in Exhibit D of the MHA Handbook.

(q–1) refers to the most recent quarter for which data is available. The HPDP table is updated on the first day of each quarter on a two quarter lag. For example, if the NPV Date is 9/1/2009, then (q–1) refers to the home price index for 2009Q1 (since 2009Q2 data is not yet available). On the other hand, if the NPV Date is 10/1/2009, then (q–1) refers to 2009Q2.

HPD(q–1) = percentage decline rounded to the nearest full percentage point. For example, if the decline was 5.3%, then HPD(q–1) = 5. If there was a growth of 5.5%, then HPD(q-1) = -6.

HPD(q–2) = percentage decline rounded to the nearest full percentage point. For example, if the decline was 4.9%, then HPD(q–2) = 5. If there was a growth of 5.5%, then HPD(q-2) = -6.

Continuing with the first example, if the NPV Date is 9/1/2009, HPD(q–2) refers to 2008Q4.

The MTMLTV Factor is a weighting factor based on the UPB of the loan prior to modification. It is equal to 0 if the MTMLTV is less than 70%; it is equal to 1/3 if the MTMLTV is at least 70% but less than 80%; it is equal to 2/3 if the MTMLTV is at least 80% but less than 90%; and it is equal to 1 if the MTMLTV is greater or equal to 90%.

If HPDP < 0 then we set the incentive to 0.

F = Forbearance amount that is ballooned without interest.
This amount may change over the life of the modification because applying of incentives as curtailments may reduce the amount of forbearance.

PRA = Principal Reduction[23]

Assume the principal forgiveness amount = Z (if there is no principal forgiveness in the NPV run, then Z = 0). At the time of the modification, the UPB is lowered by the amount Z, so that UPB_0 is equal to the Mod UPB with arrearages – Z. At the time of the modification, Z is placed in a zero interest bearing forbearance balloon.

If the borrower does not prepay and is in good standing, then one third of Z is forgiven at the end of month 12, one third at the end of month 24 and one third at the end of month 36. If a borrower prepays after the end of month 4, then any remaining PRA forgiveness amount is forgiven at prepayment. If a borrower prepays prior to the end of month 4, then any remaining PRA forgiveness amount remains in forbearance.

[23] The principal forgiveness and the related incentive payments discussed in this section ***only*** refer to principal reduction on which incentives will be paid.

As described in the PRA section, the investor receives an incentive amount, A, to compensate for principal forgiveness. If Z = 0 then A = 0. Compensation is paid at the same time that principal is forgiven. When a given proportion of Z is forgiven, the investor receives the same proportion of A as an incentive.

Mfee = Modification fee to be reimbursed to the servicer by the investor (i.e., notary fee, property valuation, and other required fees).

Note that MIPartialClaim is set to zero except when the model is used to evaluate an MI company partial claim offer subsequent to a negative NPV result and MI insurer review.

4. Mod: NPV{Loan Defaults}

For the modified loan default scenario, we assume that the loan fails six month after the initiation of the trial period. This has the effect of resetting the foreclosure process at the end of the sixth month, thus delaying the eventual REO disposition.

S ≡ Months from LPI until REO Sale

$$
\begin{aligned}
PV\{Default\} = & \left[\sum_{i=1}^{6} \frac{1}{(1+\delta)^{i}} \left\{ [\mathrm{UPB}_{i-1} - P_i + \mathrm{F}_i][\prod_{k=1}^{i-1}(1-\mathrm{SMM}_k) - \prod_{k=1}^{i}(1-\mathrm{SMM}_k)] + [\mathrm{P}_i + [\mathrm{I}_i + \mathrm{GS}_i]] \prod_{k=1}^{i-1}(1-\mathrm{SMM}_k) \right\} \right] \\
& + \frac{II_1}{(1+\delta)^3} \prod_{k=1}^{2}(1-\mathrm{SMM}_k) \\
& + \left[\sum_{j=7}^{S+6} \left[\frac{-C}{(1+\delta)^j} \right] + \frac{NPDV - MIPartialClaim}{(1+\delta)^{S+6}} \right] \prod_{k=1}^{6}(1-\mathrm{SMM}_k) \\
& + \left[\frac{\frac{1}{12} * 0.5 * HPDP}{(1+\delta)} \right] SMM_1 + \sum_{j=2}^{6} \left\{ \left[\frac{\frac{j}{12} * 0.5 * HPDP}{(1+\delta)^j} \right] SMM_j \left(\prod_{k=1}^{j-1}(1-\mathrm{SMM}_k) \right) \right\} \\
& + \left[\frac{\frac{8}{12} * 0.5 * HPDP}{(1+\delta)^8} \right] \left(\prod_{k=1}^{6}(1-\mathrm{SMM}_k) \right) \\
& + \sum_{j=4}^{6} \left\{ \frac{A}{(1+\delta)^j} \; SMM_j \prod_{k=1}^{j-1}(1-\mathrm{SMM}_k) \right\} - Mfee + MIPartialClaim
\end{aligned}
$$

Here the first term reflects the six months of cash flows resulting from the timely payments of P&I during the trial period. The second term defines the incentive payments. The third term defines the cash flows from the default that is set into motion in month seven and concludes with REO Sale in month S+6. HPDP incentives are reflected in the next three terms, and the PRA incentive payment is shown in the term after the HPDP terms.

Base NPV Model for Determining Probability of Default

The NPV model contains a simple and intuitive model for determining the probability of default – both without modification and with modification. The model was estimated using historical data and, given the limited experience with modifications that substantially reduce monthly payments, supplemented by expert judgment. Loan modification through the standard HAMP waterfall lowers the DTI and affects the default prediction of the model through a payment relief term specified as the difference between the pre-mod DTI and the program target DTI of 31%. A loan modification that includes principal reduction affects the default prediction through both a reduction in LTV and the payment relief.

The variables determining default probability are the pre-mod mark-to-market LTV (MTMLTV) of the first-lien mortgage, the borrower's current credit score, the borrower's front-end DTI before the modification, and the delinquency status of the loan. Redefault probabilities are calculated based on the same set of variables, substituting the modified MTMLTV for the pre-mod MTMLTV and adding terms incorporating the post-mod DTI and change in LTV, which would include the impact of PRA principal reductions. It is assumed that the full impact on default behavior of the principal reduction occurs immediately, and so the post-mod MTMLTV is used in the redefault equation.

For the v4 model parameters, predicted default rates increase with higher MTMLTV levels, lower credit scores, and higher pre-mod DTI levels. The model specifies a linear spline in the MTMLTV levels, which allows the slope of the LTV curve to change at different levels of MTMLTV. The model also specifies both a log-difference in DTI and linear spline in the DTI variables. For the v4 model parameters, predicted re-default rates do not increase monotonically with pre-mod DTI. Higher DTI means the borrower is at greater risk of default, but it also means a larger reduction in monthly payments, which reduces the chance of re-default; the net effect depends on the sizes of the coefficients in the redefault equations.

The v5 implementation generalizes the v4 default model specification. First, the Default and Re-default equations have been separated into 2 equations. Second, in the v4 NPV model, default rates for 'Current' and 'D30' loans that are in imminent default are evaluated using the 'D60' model. To retain this v4 feature while allowing for future version with specific 'Current' and 'D30' default models, the specification provides for separate 'Current' and 'D30' default models but the initial release of parameters for 'Current' and 'D30' loans mirror the V4 'D60' parametric specification. Third, to provide additional flexibility for future revisions, the implementation also specifies separate sets of parameter values for the owner-occupied and non-owner-occupied default models. Fourth, the specification has been generalized to allow for payment reduction effects (via changes in DTI) to be modeled either with the logarithm term used in V4, or through a more flexible linear spline structure. The V5 specification will initially retain the logarithmic term, but future updates may capture payment reduction effects using linear spline terms.

The specification for the model is shown below. The specification is based upon logistic regressions with separate equations by loan status (current, D30, D60, D90+). This implementation of the model requires that separate default and redefault equations by loan status

be implemented for current and D30 loans, allowing for future updates that will apply distinct default models to these loans.

To calculate the probabilities the anti-logit transformation must be applied. That is, for each Z listed below:

$$\text{Probability of Default} = \text{Exp}(Z_{\text{Default}}) / (1 + \text{Exp}(Z_{\text{Default}}))$$
$$\text{Probability of Redefault} = \text{Exp}(Z_{\text{Redefault}}) / (1 + \text{Exp}(Z_{\text{Redefault}}))$$

The specification of the default model, for each DLQ status, is as follows:

$$\begin{aligned} Z_{\text{Default}} = {} & \alpha_0 + \alpha_1 * \text{MTMLTV} + \alpha_2 * \max\{0, \text{MTMLTV} - 80\} + \alpha_3 * \max\{0, \text{MTMLTV} - 100\} + \\ & \alpha_4 * \max\{0, \text{MTMLTV} - 120\} + \alpha_5 * \max\{0, \text{MTMLTV} - 150\} + \\ & \alpha_6 * \text{CREDIT\_SCORE} + \alpha_7 * \max\{0, \text{CREDIT\_SCORE} - 580\} + \\ & \alpha_8 * \max\{0, \text{CREDIT\_SCORE} - 660\} + \alpha_9 * \max\{0, \text{CREDIT\_SCORE} - 720\} + \\ & \alpha_{10} * \text{DTI\_START} + \alpha_{11} * \max\{0, \text{DTI\_START} - 36\} + \alpha_{12} * \max\{0, \text{DTI\_START} - 46\} + \\ & \alpha_{13} * \max\{0, \text{DTI\_START} - 61\} \end{aligned}$$

The specification of the redefault model, for each DLQ status, is as follows:

$$\begin{aligned} Z_{\text{Redefault}} = {} & \beta_0 + \beta_1 * \text{MTMLTV} + \beta_2 * \max\{0, \text{MTMLTV} - 80\} + \beta_3 * \max\{0, \text{MTMLTV} - 100\} + \\ & \beta_4 * \max\{0, \text{MTMLTV} - 120\} + \beta_5 * \max\{0, \text{MTMLTV} - 150\} + \\ & \beta_6 * \text{CREDIT\_SCORE} + \beta_7 * \max\{0, \text{CREDIT\_SCORE} - 580\} + \\ & \beta_8 * \max\{0, \text{CREDIT\_SCORE} - 660\} + \beta_9 * \max\{0, \text{CREDIT\_SCORE} - 720\} + \\ & \beta_{10} * \text{DTI\_START} + \beta_{11} * \max\{0, \text{DTI\_START} - 36\} + \beta_{12} * \max\{0, \text{DTI\_START} - 46\} + \\ & \beta_{13} * \max\{0, \text{DTI\_START} - 61\} + \\ & \beta_{14} * \text{LN}(1 + \Delta\text{DTI}) + \\ & \beta_{15} * \Delta\text{DTI} + \beta_{16} * \max\{0, \Delta\text{DTI} - 5\} + \beta_{17} * \max\{0, \Delta\text{DTI} - 15\} + \beta_{18} * \max\{0, \Delta\text{DTI} - 30\} + \\ & \beta_{19} * \Delta\text{MTMLTV} + \beta_{20} * \max\{0, \Delta\text{MTMLTV} - 5\} + \beta_{21} * \max\{0, \Delta\text{MTMLTV} - 10\} + \\ & \beta_{22} * \max\{0, \Delta\text{MTMLTV} - 20\} + \beta_{23} * \max\{0, \Delta\text{MTMLTV} - 30\} \end{aligned}$$

where:
MTMLTV = Mark-to-market LTV; value ranges from 0 to 999.99999 (of the first lien but not junior liens). For the default equation, MTMLTV is the pre-mod MTMLTV whereas in the redefault equation it is the post-mod MTMLTV. In cases where a proposed modification involves no principal reduction, the pre-mod MTMLTV will equal the post-mod MTMLTV.
The function Max{a, b} equals the larger of the two inputs a and b.
Credit_Score = Current credit score or equivalent (minimum of borrower or co-borrower).
DTI_START = Pre-mod front-end ratio; value ranges from 0 to 100.
DTI_MODIFIED = Post-mod front-end ratio; value ranges from 0 to 100.
ΔDTI = DTI_START – DTI_MODIFIED
ΔMTMLTV = post-mod MTMLTV - pre-mod MTMLTV

(α, β) are coefficient values. Separate (α, β) coefficients for owner-occupied and non-owner occupied default models will be provided.

The model coefficients were set to be consistent with observed default rates on a broad loan population using data selected from HAMP modifications, GSE seasoned loans, ABS/MBS data from CoreLogic, and other data. Coefficients will be updated as additional performance data becomes available.

Prepayment Model for Determining Single Month Mortality (SMM)

A logistic regression model is used to estimate prepayment rate. The model has the following structure:

$$SMM_k = Exp(P_k) / (1 + Exp(P_k))$$

Where SMM_k is the monthly prepayment rate in month k and P_k is the predicted value from the regression.

The model has the same structure but different coefficients for loans with different delinquency status (current, D30, D60, D90+). There are no separate models for loans in the mod and no mod scenarios. The impacts of loan modification on prepayment rate are captured through the explanatory variables in the model. The explanatory variables used in the model are: Refinancing incentive (INCT), 12-month home price growth rate (HPA12),[24] mark-to-market LTV (MTMLTV)[25] , current credit score, and original loan amount (Orig_Amt). The predictor, P_k, is specified as

$$P_k = \beta_0 + \beta_{INCT} * INCT + \beta_{HPA12} * HPA12 + \beta_{MTMLTV} * MTMLTV + \beta_{FICO} * CreditScore + \beta_{Loan\_Amt} * Orig\_Amt$$

Before we examine the regression coefficients we define in detail the refinancing incentive variable ("INCT"). The refinancing incentive that is adjusted for the benefits of principal forbearance and annual principal reduction upon performance is given by

$$Incentive(t) = \left[\frac{(UPB(t) - F(t))}{UPB(t)} * WAC(t) - ERRate \right] * \left(\frac{UPB(t) - F(t)}{UPB(0) - F(0)} \right) - Adj$$

where:

[24] The house price growth is at the MSA/region level. As in the HPD there are 110 possible paths. Note that values are provided for the last four quarters and 3 years into the future. At the end of the third year, we use a "flat lined" value equal to an annual growth rate of 4.5%. To convert the quarterly data into monthly data we assume that the index in the quarter corresponds to the index for the last month in the quarter. We further assume that the growth is the same for each month in the quarter. That is, if the quarterly growth rate is x, then the monthly growth is equal to $[(1+x)^{1/3} - 1]$.

[25] The mark-to-market LTV is calculated using the UPB from the previous period. The value is taken as the property value in the previous period multiplied by the house price growth from the last period to the current period.

WAC = Current note rate or the modified note rate
UPB(t) = The total unpaid principal balance of the loan at time, t
F(t) = Principal forbearance at time, t
ERRate = Effective Refinancing Rate. For owner-occupied modifications, use Freddie Mac's PMMS weekly rate for 30-year fixed-rate conforming loans. For non-owner-occupied modifications, use the sum of the PMMS and a premium.
Prepayment rate should be calculated assuming the full impact of the PRA principal reduction upfront. In case of prepayment, the borrower receives the full principal reduction amount.
The "Adj" refers to the adjustment to the refinancing incentive resulted from the Borrower Pay-for-Performance Payments. In rate terms, this adjustment is given by:

$$adj_1(t) = \sum_{j=1}^{6} \frac{k(t,j) * M}{(1+\delta)^{(12*j-t)}} \frac{1}{UPB(t)} \frac{1}{m}$$

Where t is number of months the loan has been in the modification, and M is the Borrower Pay-for Performance incentive.
For *j=1* through *5*:

- For a HAMP Tier 1 modification that reduces the total monthly housing expense (PITIA) by 6% or more (HAMP de minimis test), *M* is the lesser of $1,000 or half the reduction in the borrower's annualized monthly payment.
- For a Tier 2 modification M is $0.00

For *j=6* of either a HAMP Tier 1 modification or a HAMP Tier 2 modification, M is equal to $5,000.

Given these conditions, $k(t,j) = 1$ if $t \leq 12*j$, and 0 otherwise. m is the effective "multiple" to translate points to rates. We use m=6.

All of the explanatory variables enter the regression in the piece-wise linear (spline) form. Note that all coefficients include five decimal places.

To model non-owner-occupied prepayment behavior for Tier 2 non-owner-occupied modifications, there will be a separate set of logistic prepayment model parameters and spline specifications.

The coefficients values in the table below are for illustrative purposes only.

Category	**Coefficient**				**Spline**
	Current	**D30**	**D60**	**D90**	
Intercept	-6.7729	-4.7985	-4.4546	-1.3705	1
12 Month HPI growth I	23.3362	8.1546	13.8971	18.9408	min(-0.08, hpag)
12 Month HPI growth II	-11.3299	6.6634	4.5143	-2.0232	max(-0.08, min(-0.05, hpag))-(-0.08)
12 Month HPI growth III	12.4974	20.22	23.7722	23.9895	max(-0.04, min(-0.00, hpag))-(-0.04)

Category	Coefficient				Spline
	Current	D30	D60	D90	
12 Month HPI growth IV	10.7123	5.0652	1.0688	-3.1855	max(-0.00, min(0.05, hpag))-(-0.00)
12 Month HPI growth V	4.3429	7.0244	9.3115	10.8255	max(0.05, min(0.10, hpag))-(0.05)
12 Month HPI growth VI	-12.4447	-7.7359	-4.3129	-3.9838	max(0.10, hpag)-0.10
INCT I	0.5756	1.3932	0.5502	1.412	min(-1.5, inct)
INCT II	0.0138	0.2049	0.4882	0.157	max(-1.5, min(-1, inct))-(-1.5)
INCT III	0.8138	0.3472	0.0295	0.02	max(-1, min(0, inct))-(-1)
INCT IV	1.6147	0.4737	0.0157	0.0187	max(0, min(0.5, inct))-0
INCT V	1.119	0.3491	-0.00916	0.0141	max(0.5, min(1, inct))-0.5
INCT VI	0.1815	0.0128	0.0728	0.008	max(1.0, min(1.5, inct))-1.0
INCT VII	-0.0533	0.0468	0.1173	0	max(1.5, min(2, inct))-1.5
INCT VIII	-0.1551	-0.0617	-0.0406	0	max(2.0, min(2.5, inct))-2.0
INCT IX	-0.1037	-0.0133	0.0617	0	max(2.5, inct)-2.5
MTMLTV I	0.003	-0.00186	-0.00849	-0.0179	min(50, mltv)
MTMLTV II	-0.00765	-0.0187	-0.0262	-0.0371	max(50, min(70, mltv)) - 50
MTMLTV III	-0.0296	-0.0195	-0.0282	-0.0445	max(70, min(80, mltv)) - 70
MTMLTV IV	-0.00812	-0.0214	-0.0367	-0.0639	max(80, min(90, mltv)) - 80
MTMLTV V	-0.0847	-0.1094	-0.0719	-0.0821	max(90, min(100, mltv)) - 90
MTMLTV VI	-0.0716	-0.0998	-0.1143	-0.0916	max(100, min(110, mltv)) - 100
MTMLTV VII	-0.0434	-0.0432	-0.0353	-0.0294	max(110, mltv) - 110
Credit Score I	0.0034	0.00119	0.00064	0.00015	min(640, credit score)
Credit Score II	0.00021	0.00064	0.00059	0.00047	max(640, min(700, credit score)) - 640
Credit Score III	0.00166	0.00479	0.00505	0.00655	max(700, min(760, credit score)) - 700
Credit Score IV	-0.00293	-0.00181	0.00126	0.00105	max(760, credit score) - 760
Original Amount I	0.0158	0.0132	0.013	0.0115	min(80, amt)
Original Amount II	0.00683	0.00603	0.0043	0.0056	max(80, min(140, amt)) - 80
Original Amount III	0.00327	0.00285	0.00172	0.00194	max(140, min(220, amt)) - 140
Original Amount IV	0.00084	-0.00115	-0.00012	-0.00158	max(220, min(300, amt)) - 220
Original Amount V	0.00057	0.00038	-0.00231	-0.00335	max(300, amt) - 300

Note that we bound the values of the independent variables as follows:

- If “hpag” is less than -0.5 it is set equal to -0.5 and if it is greater than 0.5 it is set equal to 0.5
- If “inct” is less than - 5 it is set equal to - 5 and if it is greater than 3 it is set equal to 3

- If “mltv” is less than 40 it is set equal to 40 and if it is greater than 180 it is set equal to 180
- If “credit score” is less than 400 it is set equal to 400 and if it is greater than 800 it is set equal to 800
- amt = orig_amt/1000; If “amt” is less than 50 it is set equal to 50 and if it is greater than 500 it is set equal to 500

To clarify how to calculate the predicted value, P_k, we provide an example. Suppose in month k the HPI growth is -5% (i.e., hpag=-0.05), inct=1, mltv=60, Credit Score=720 and the original amount was $100,000 (amt=100). For a current loan:

P_k = -6.72290 + [23.33620*(-0.08) + -11.32990*0.03]+
[0.57560*(-1.5) + 0.57560*0.5 + 0.81380*1 + 1.61470*0.5 + 1.11900*0.5] +
[0.00300*50 +0.00765*10] +
[0.00340*640 + 0.00021*60 + 0.00166*20] +
[0.01580*80 + 0.00683*20]
= -3.95964

Thus, $SMM_k = Exp(P_k) / (1 + Exp(P_k)) = 1.8713\%$

VI. Re-evaluating Borrowers after an NPV Decision

In some cases, a borrower may need to be re-evaluated for NPV after a servicer has already provided a decision on the borrower’s initial application for a modification. There are three reasons that a borrower might need to be re-evaluated:

1. There has been an error in the initial NPV test used to decision the borrower.
2. There has been a material change in the borrower’s circumstances.
3. There has been a change in HAMP policies.

Each of these cases is covered in detail below. For each, the servicer must establish and maintain a process to identify and track the NPV record used to decision the borrower (or the “run-of-record”).

Error in the Initial NPV Test

An error in an initial NPV Test could be identified by the servicer itself, by the borrower upon receipt of a Dodd-Frank Denial Letter, or by MHA-C during an onsite audit. In any of these three situations, the servicer is required to re-evaluate the borrower using the initial run-of-record, changing only the input or inputs that are found to be incorrect. The servicer is also required to change any fields that are dependent on the incorrect input(s); for example, if the borrower disputes Property Value, the servicer should re-calculate MTMLTV and Standard Waterfall terms, along with PRA Waterfall and Max Months Past Due in Past 12 Months if the loan

becomes PRA-eligible or loses PRA eligibility due to the change in MTMLTV. All other fields must be held constant, including NPV Date (as this field is used to pull the appropriate PMMS rate and for NPV code versioning).

Per the MHA Handbook, in the case of a borrower dispute, the borrower will have at least 30 calendar days from the date of the Non Approval Notice to submit written evidence to the servicer that one or more of the NPV input values from the original run-of-record is inaccurate. If the borrower identifies material inaccuracies in the NPV input values, the servicer may not conduct a foreclosure sale until the inaccuracies are reconciled. If the evidence submitted by the borrower is valid and material to the NPV outcome, the servicer must perform the NPV calculation with the correct input values. Following the re-evaluation, the servicer must provide the updated NPV outcome and input values to the borrower.

In the case of an error in the initial NPV test, the servicer must be able to identify the original run-of-record in order to determine which inputs to hold constant. After the loan is re-evaluated, a separate run-of-record must be created. In addition, the servicer must be able to distinguish the runs-of-record of the original evaluation and of the re-evaluation, and both runs-of-record must be reported to the Program Administrator.

Material Change in Borrower's Circumstances

A borrower may be eligible for a re-evaluation due to a material change in circumstances in any of the following cases:

- The borrower was evaluated for HAMP but initially did not meet the minimum eligibility criteria. Since that time, the borrower's circumstances have changed such that eligibility criteria may now be met.
- The borrower was evaluated for HAMP and met the minimum eligibility criteria, but received a negative NPV test result, was denied due to excessive forbearance, or was otherwise unable to obtain a modification. Since that time, the borrower's circumstances have changed such that the borrower may now receive a different NPV test result.
- The borrower was evaluated for HAMP and received a positive NPV test result. Since that time, circumstances have changed such that the borrower may now receive different waterfall terms.

In case of a material change in circumstances, the servicer should disregard the borrower's initial application and run-of-record and create a separate, new application with a current NPV date. The servicer should evaluate the borrower based on this new application and designate this run as a run-of-record, with its own NPV Date. All runs-of-record must be reported to the Program Administrator.

Change in HAMP Policies

Borrowers may apply again for a modification after changes to HAMP (e.g., Tier 2). Per SD 12-02, servicers are not required to solicit borrowers who, prior to the HAMP Tier 2 Effective Date, could be classified into one of the following categories:

- Borrowers who were two or more payments delinquent and did not occupy the mortgaged property as a primary residence;
- Borrowers who were two or more payments delinquent and were already solicited in accordance with the reasonable effort requirement;
- Borrowers who were evaluated and determined to be ineligible for HAMP; and
- Borrowers who had a payment default on a trial period plan or lost good standing on a permanent HAMP modification.

However, borrowers can request consideration for HAMP Tier 2, and, upon submission of an Initial Package, must be evaluated for the appropriate Tier based on their eligibility.

As in the cases described above, the servicer must report all runs-of-record to the Program Administrator.

VII. Guidance on Re-coded Models

The guidance in this document is generally applicable to all servicers—both Portal users and re-coders. However, re-coders and servicers considering developing re-coded models should also be aware of the process of obtaining certification for a re-coded model, the role of MHA-C, and other ongoing requirements for re-coders.

NPV Model Compliance Requirements for Servicers

Servicers seeking to implement the NPV model logic into their systems are required to first obtain model certification from MHA Compliance (MHA-C), prior to model use. The objective of this certification is to assure that:

- all servicer NPV model implementations provide results that are consistent with Treasury's Portal NPV model; and
- servicers operating NPV model implementations possess an adequate level of model management capability within their enterprise

Overview of MHA-C's Role in NPV Compliance

For servicers with certified implementations of the NPV model, MHA-C performs three primary types of testing and monitoring related to the NPV model:

1. **NPV Output Testing:** MHA-C performs analytical testing of a servicer's re-coded HAMP NPV model as a prerequisite to certifying such models for use in evaluating loans

for HAMP. Testing occurs regularly thereafter (as long as the servicer continues to use the re-coded model). The objective of the NPV Output Test is to ensure that a servicer's re-coded implementation of the HAMP NPV model provides NPV outputs that align with Treasury's NPV model within standard thresholds. Passing the NPV Output Test is required in order for a servicer to be certified as having an approved implementation of the HAMP NPV model. Once the servicer's results are approved by Treasury and the servicer receives a formal certification letter from MHA-C, it is free to begin utilizing its re-coded HAMP NPV model in production.

2. **NPV Onsite Review:** MHA-C performs onsite reviews for each servicer with an approved re-coded implementation of the HAMP NPV model. Onsite reviews are intended to ensure that the servicer possesses adequate model management capabilities, including clear model ownership, adequate model documentation, appropriate governance practices, the ability to maintain version control, and related capabilities.
3. **Monitoring of data inputs to the NPV Model:** MHA-C reviews loan submissions to ensure reasonableness of model use in light of relevant HAMP Policies. MHA-C may ask servicers to provide samples of production data inputs to the NPV model (from the servicer's loss mitigation system) to assess model input quality.

Certification Requirements and Process

MHA-C requires that servicers with the intent to recode the base NPV model perform the following steps prior to certification:

1. If applicable, complete all remediation activities required by MHA-C from prior NPV audits.
2. Notify MHA-C of intent to re-code model. Servicers must successfully pass output tests administered by MHA-C.
3. Ensure that the re-coded NPV model is capable of capturing and storing results of the NPV and Principal Reduction Alternative (PRA) NPV runs.
4. Ensure that the re-coded NPV model provides validation of NPV inputs that is at least as rigorous and comprehensive as that of the Treasury Portal NPV, as described in this Model Documentation.
5. Ensure that the NPV model has passed servicer system/integration testing, and has been approved by applicable servicer model governance bodies (with signoff from appropriate loss mitigation executives).
6. Implement error checking of re-coded NPV model inputs, consistent with error checking resident in the Treasury NPV portal (see error checking section below).
7. Implement a quality assurance (QA) protocol to ensure that the servicer's re-coded NPV model is independently validated on a monthly basis against the Treasury NPV portal using a statistically valid sample of the servicer's own production loans, with commensurate reporting of QA results to MHA-C (refer to section on QA protocol below).

8. Provide MHA-C with a process flow for the recoded NPV model (including data sourcing and data storage).
9. Draft a contingency plan to begin using the Treasury NPV portal within 30 days of any de-certification of the re-coded NPV model by MHA-C.
10. Acknowledge terms of use for a re-coded base NPV model, including ongoing testing by MHA-C for the life of HAMP, and participate in any orientation or training as required by MHA-C.

Servicer Self-Testing and Quality Assurance

Periodically, MHA-C will publish a new self-administered sample of synthetic loans with an integrated answer key. The sample is updated to be consistent with the updated economic assumptions in effect for that quarter. Servicers with certified re-coded models are expected to conduct quarterly self-testing using this self-test deck. The objective is to ensure that the servicer's re-coded model continues to provide NPV outputs consistent with that of the Treasury Portal.

Each servicer is also required to implement an independent QA program for its re-coded NPV model that compares NPV outputs on a sample of production loans against NPV outputs obtained through a Treasury Portal NPV run. Elements of this QA program must include the following on a monthly basis:

- use of a statistically valid sample of loans out of the population submitted through the servicer's re-coded model during the preceding month;
- analysis of the sample for consistency with model logic (i.e., through NPV variance and swap-in/swap-out metrics) and model use (e.g., consistency of inputs used for the Principal Reduction and Standard NPV runs) requirements; and
- reporting of monthly QA results to MHA-C;

Servicers of Fannie Mae and Freddie Mac loans must follow the respective GSE guidance regarding building the NPV model into their own platform/systems.

Model Versioning Requirements

Aside from certification and testing requirements, re-coders should be careful to maintain control of the versions of NPV code used in their testing.

When a borrower is re-evaluated for NPV after an error in the initial run, the servicer should test the borrower using the same major version of the NPV model that was used to test the loan for trial modification eligibility. Major version refers to the first significant digit in a version number. For example, v1.1, v1.2, and v1.3 are all treated as version 1. The HAMP Portal will use the best release of each major version to satisfy the versioning requirement. For example, v1.52 will become version 1, v2.01 will become version 2. New applicants should be tested using the latest available version of the NPV model. In deciding which version of the NPV model to use

for subsequent re-runs, the servicer should use the model version that corresponds to the NPV Date.

VIII. NPV Data Reporting Requirements

Per the requirements initially described in Supplemental Directive 09-06 and subsequently updated in the MHA Handbook for Servicers, re-coder servicers are required to provide loan level NPV data reporting to the Program Administrator. The data must be accurate, complete, and consistent with the servicer's records.

When reporting loan-level NPV data to the Program Administrator, servicers should submit only records that were used to decision borrowers' modification applications ("runs-of-record"). Any additional model output that was not used to decision borrowers should not be reported.

IX. Calculation Logic for HAMP Tier 1 and Tier 2 Waterfalls

This section discusses the waterfall logic described in the HAMP term sheet. The servicer is responsible for verifying program eligibility and the modification terms.

Basic Eligibility
Eligible loans must be originated on or before January 1, 2009. If that criteria is met, new borrowers will be accepted as long as the borrower submitted an initial package on or before December 31, 2016. Program payments will be made for up to five years after the Modification Effective date. UPB limits (pre-modification and pre-capitalization) are as follows:

- 1 Unit $729,750
- 2 Units $934,200
- 3 Units $1,129,250
- 4 Units $1,403,400

HAMP Tier 1 Standard Modification Waterfall

Step 1: Calculate Current Debt to Income (DTI)
Calculate the borrower's front-end DTI based on current mortgage payment and gross monthly income. If the loan is an adjustable-rate mortgage (ARM), interest-only mortgage (IO), or another product type featuring a scheduled rate increase, and the interest rate is expected to reset within 120 days, DTI is calculated as follows: For non-GSE loans, amortize the loan using the reset interest rate, current UPB, and the remaining term. For ARM or IO loans not resetting within 120 days, use the current scheduled monthly mortgage payment (which, in the case of Pay Option Loans that are ARM loans, means the minimum payment required under the loan documents regardless of which payment the borrower elected to pay in the prior period) and the note interest rate in effect at the time of evaluation. For GSE loans, use the current monthly

payment. For NPV evaluations, servicers should use the UPB as of the Data Collection Date. Servicers should not project or estimate the UPB as of a future date.

Step 2: Capitalize Arrearage
The servicer capitalizes accrued interest, out-of-pocket escrow advances to third parties, and any required escrow advances that will be paid to third parties by the servicer during the trial period plan as well as those servicing advances that are made for costs and expenses incurred in performing servicing obligations.

Step 3: Forgive Principal
There is no requirement to use principal reduction under the program, and it is not a formal step in the HAMP Standard Waterfall process. However, servicers may forgive principal to achieve the front-end DTI target. Principal forgiveness can be used on a stand-alone basis or before steps 4, 5, or 6 in the Standard Waterfall process. Principal forgiveness is applied to the UPB, and subsequent steps in the Standard Waterfall are carried out until 31% target DTI ratio is achieved. If principal is forgiven and the interest rate is not reduced, the rate will be frozen at its existing level and treated as a modified rate for the purposes of the interest rate cap.

In the event of principal forgiveness, the Payment Reduction Cost Share continues to be based on the change in the borrower's monthly payment from 38% to 31% front-end DTI ratio and is limited to five years.

Step 4: Reduce Interest Rate
Reduce note rate in increments of 0.125% to get as close to the target DTI of 31% as possible, without reducing the borrower's DTI below 31%. The interest rate floor is the minimum of 2% and the pre-modification interest rate. If the target DTI is met and the resulting interest rate is higher than the interest rate cap[26], then the resulting rate will be the note rate for the life of the modification and the payment (P&I) will be fixed for the life of the loan. If the resulting rate is below the interest rate cap, the reduced rate will be in effect for the first five years followed by annual increases of one percentage point per year (or a lesser amount as needed) until the interest rate reaches the interest rate cap. Borrower's monthly installment will be revised annually, if and when there is an interest rate reset, based on the statement above. If the target DTI cannot be reached at the 2% rate floor, term extension is considered.

Step 5: Extend Term
Re-amortize and extend the loan to a maximum 40-year term in monthly increments to reach as close to the target 31% DTI without going under. The modification term should not be lower than the current remaining term. If the loan's current remaining term is greater than 480 months, use the remaining term as the modification term; no term extension should be given. If the target

[26] See definition in Chapter II, Section 9.3.6 of the MHA Handbook. The "Interest Rate Cap" is the Freddie Mac Weekly Primary Mortgage Market Survey (PMMS) weekly rate for 30-year fixed-rate conforming loans, rounded to the nearest 0.125 percent, as of the date that the modification agreement is prepared.

DTI cannot be reached with the maximum term extension, then principal forbearance is considered.

Step 6: Forbear Principal
Principal is forborne until the target DTI is achieved. The forbearance amount is added as a balloon payment to the end of the loan and no interest is collected on the forbearance amount. If the option to defer is selected, the servicer/lender shall forbear on collecting the deferred portion of the capitalized balance until the earlier of:

- maturity of the modified loan,
- a sale of the property, or
- a pay-off or refinancing of the loan

If the modification is NPV negative and the servicer chooses to modify the loan, forbearance can be no more than the difference between the unpaid balance and the current property value. If the target DTI cannot be reached with principal forbearance, principal forgiveness can be considered.

HAMP Tier 2 Standard Modification Waterfall
The Base NPV model will internally generate the Tier 2 waterfall terms for non-occupant borrowers or owner occupant borrowers that do not meet the basic eligibility criteria for HAMP Tier 1 as follows and depicted in Figure 3.

Step 1: Capitalize arrearage
The servicer capitalizes accrued interest, out-of-pocket escrow advances to third parties, and any required escrow advances that will be paid to third parties by the servicer during the trial period plan as well as those servicing advances that are made for costs and expenses incurred in performing servicing obligations. This capitalized UPB amount is an input to the Base NPV model.

Step 2: Adjust Interest Rate
The Base NPV model adjusts the interest rate to the current "Tier 2 Rate", which is a based on the weekly Freddie Mac Primary Mortgage Market Survey (PMMS) Rate for 30-year fixed rate conforming loans, rounded up to the nearest 0.125 percent plus a rate adjustment expressed in basis points. There could be a separate rate adjustment for owner-occupied and non-owner-occupied modifications. The rate adjustment values are set by MHA policy, and may be changed via the regular quarterly supplemental data update process. The rate adjustments, expressed in basis points, may be positive, negative, or zero. If the note rate of the modification is not permitted to be adjusted under the applicable servicing agreement or law below a certain value, the base NPV model will use the servicer-provided override rate. The Tier 2 Rate will be the note rate for the life of the modification. See Appendix D for history of rate adjustment policy.

Step 3: Extend Term
The base NPV model extends the term and re-amortizes the mortgage to 480 months from the Data Collection Date. If the loan's current remaining term is greater than 480 months, use the remaining term as the modification term; no term extension should be given. If the term of the

modification is not permitted to be extended to 480 months under the applicable servicing agreement or law beyond a certain value, the base NPV model will use the servicer-provided override term.

Step 4: Forbear Principal
If the loan's post-capitalization mark-to-market loan to value (MTMLTV) ratio is greater than 115 percent, the base NPV model will calculate the principal forbearance in an amount equal to the lesser of (i) an amount that would create a post-modification MTMLTV ratio of 115 percent using the interest bearing principal balance or (ii) 30 percent of the post-modified UPB of the mortgage loan (inclusive of capitalized arrearages). Unlike HAMP Tier 1 however, there is no concept of excessive forbearance that would potentially disqualify a loan from modification. If there is a limit on the forbearance amount under the applicable servicing agreement or law, the base NPV model will use the investor-required override forbearance amount.

Step 5: Evaluate Eligibility
If the Tier 2 modified P&I payment fails to meet the P&I payment change or allowable DTI requirements set forth by Treasury, or any alternate eligibility requirements set by servicers in their written policy, the borrower is not eligible for a HAMP Tier 2 modification. See Appendix D for the history of risk P&I payment and allowable DTI requirements.

Note: For adjustable rate mortgage (ARM) loans (including pay option loans and interest only ARM loans), interest only (I/O) loans, or other product types featuring a scheduled payment increase within 120 days, the pre-modification monthly P&I payment used for the comparison should be determined in accordance with the current guidance set forth in Section 6.1.2.1 Chapter II of the MHA Handbook.

Debt-to-Income Calculation for Non-Owner-Occupied Properties.
If the property under evaluation is a non-owner occupied property, the debt-to-income ratio is the monthly housing expense of the primary residence for all borrowers/co-borrowers (plus negative net cash flow of the property under evaluation, if any), divided by the monthly gross income of all borrowers (plus positive net cash flow of the property under evaluation, if any).

Note: the servicer must take into account the net cash flow of the property under evaluation when calculating the debt-to-income ratio. Positive net cash flow from the property under evaluation must be added to the borrower's gross monthly income for purposes of calculating the post-modification housing expense-to-income ratio. Negative net cash flow from the property under evaluation must be added to the borrower's primary residency expense.

Note: The net cash flow for the property under evaluation will be calculated as 75% of the monthly gross rental income, reduced by the monthly housing expense of the property under evaluation. The 75% factor is to account for vacancy loss and maintenance expenses.

Example 1 (positive cash flow)
Primary Residence Housing Expense of all borrowers/co-borrowers = $1500
Monthly Housing Expense for the property under evaluation = $1000
Monthly Gross Rental Income from the property under evaluation = $1400
Borrowers Monthly Gross Income = $4500

Calculate Net Cash Flow for the property under evaluation = ($1,400 * 75%) - $1,000
= $50

DTI = $1500 / ($4500 + $50)
= 32.97%

Example 2 (negative cash flow)
Primary Residence Housing Expense of all borrowers/co-borrowers = $1500
Monthly Housing Expense for the property under evaluation = $1000
Monthly Gross Rental Income from the property under evaluation = $900
Borrower's Monthly Gross Income = $4500

Calculate Net Cash Flow for the property under evaluation = ($900 * 75%) -$1,000
= ($325)

DTI = ($1500 + $325) / $4500
= 40.56%

Example 3 (not receiving rental income)
Primary Residence Housing Expense of all borrowers = $1500
Monthly Housing Expense for the property under evaluation = $1000
Monthly Gross Rental Income from the property under evaluation = $0
Borrower's Monthly Gross Income = $4500

Calculate Property Net Cash Flow for the property under evaluation = ($0 * 75%) - $1,000
= ($1,000)

DTI = ($1500 + $1000) / $4500
= 55.56%

X. Appendices

A. Waterfall Logic Flow

Figure 2. HAMP Tier 1 Standard Waterfall HAMP Logic Flow

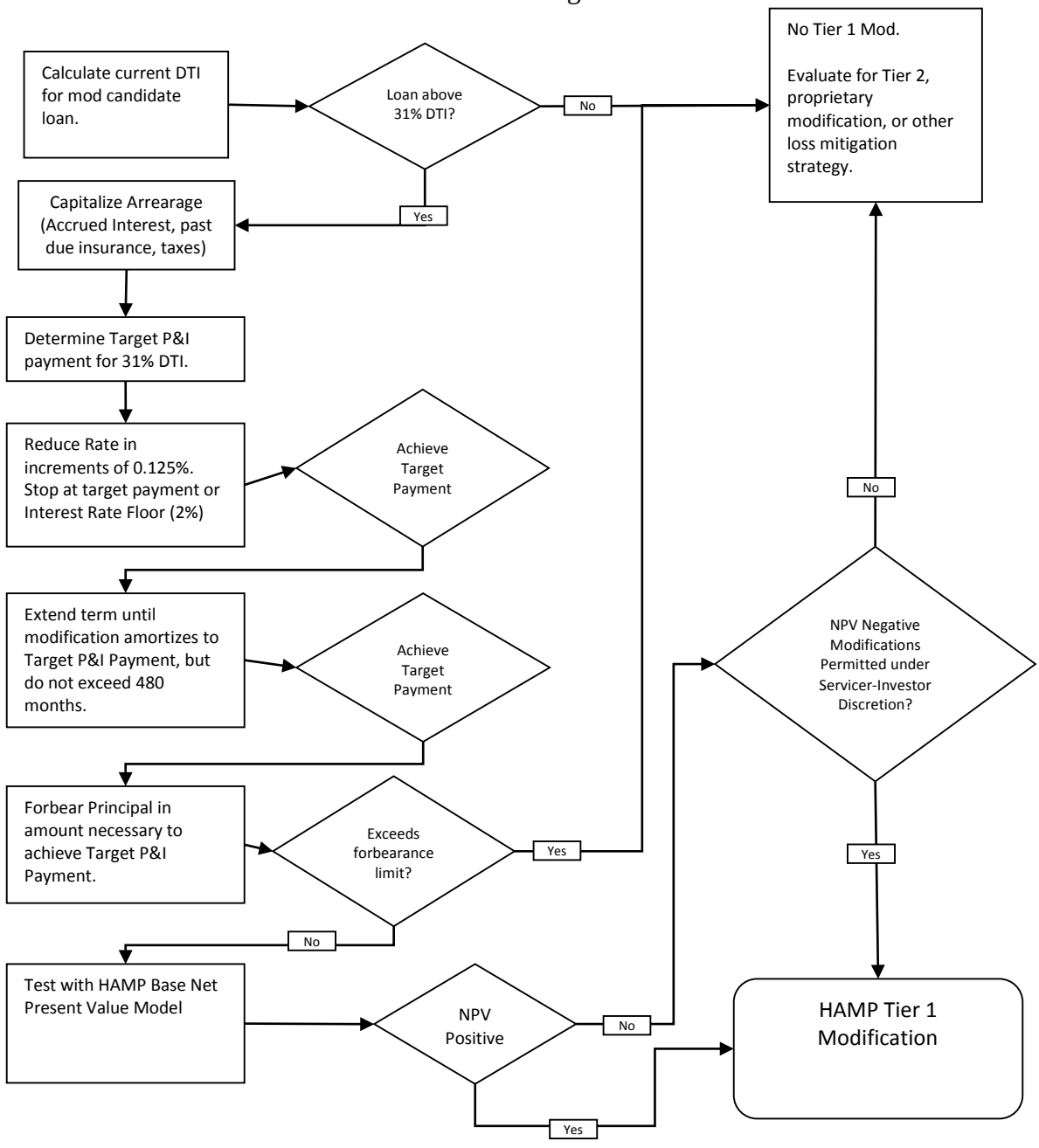
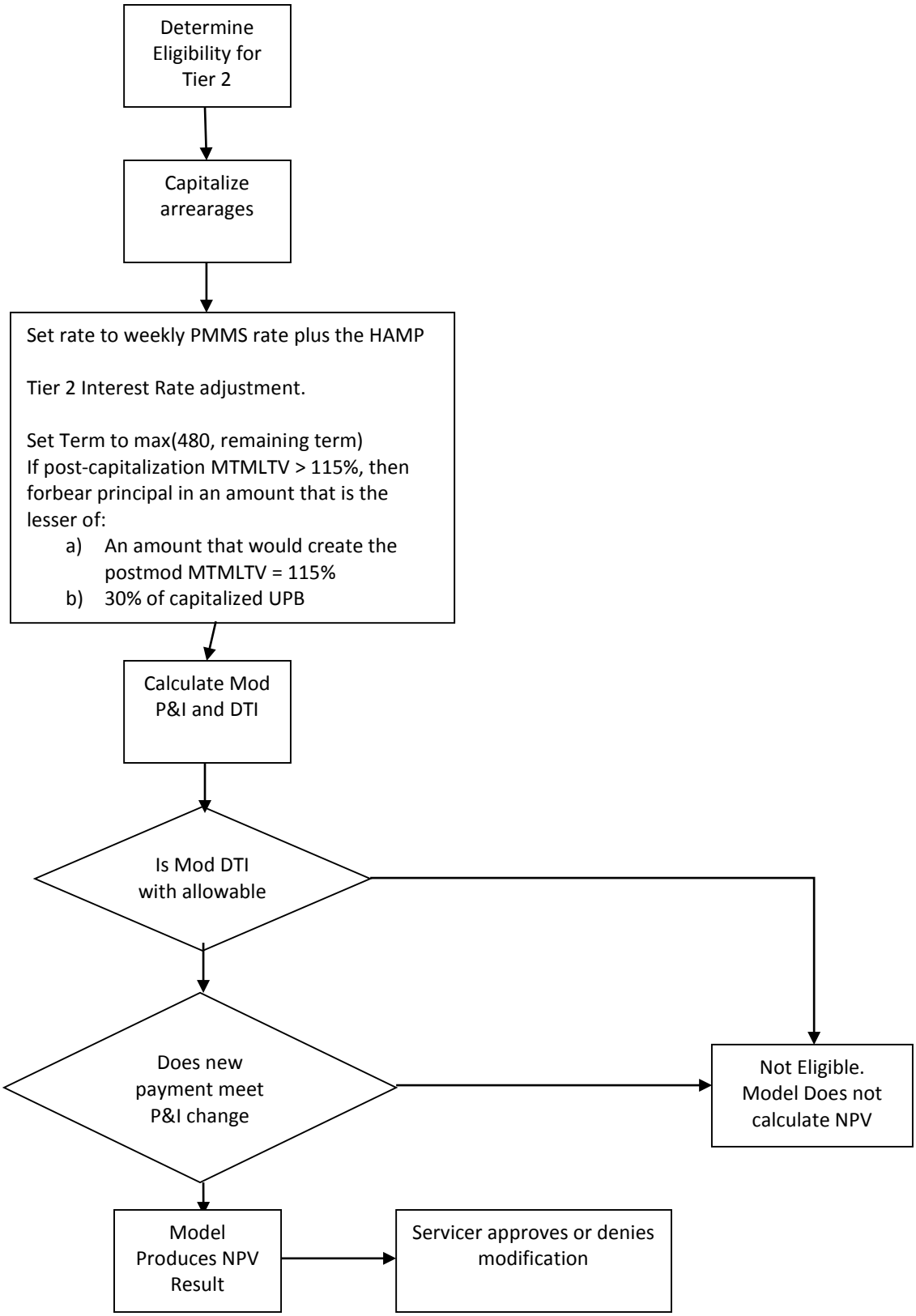


Figure 3. HAMP Tier 2 Standard Waterfall Logic Flow



B. Default Tables

Default Model Parameters (for Owner-Occupied Properties)

Variable	Current		D30		D60		D90+	
	Default	Redefault	Default	Redefault	Default	Redefault	Default	Redefault
Intercept	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-1.75	-1.75
MTMLTV	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0.0255	0.0255
Max[0, MTMLTV –80]	0	0	0	0	0	0	0	0
Max[0, MTMLTV -100]	-0.01084	-0.01084	-0.01084	-0.01084	-0.01084	-0.01084	0	0
Max[0, MTMLTV -120]	-0.01448	-0.01448	-0.01448	-0.01448	-0.01448	-0.01448	-0.01309	-0.01309
Max[0, MTMLTV -150]	0	0	0	0	0	0	0	0
ΔMTMLTV=(MTMLTV_Start – MTMLTV_Modified)	NA	0	NA	0	NA	0	NA	0
Max[0, ΔMTMLTV–5]	NA	0	NA	0	NA	0	NA	0
Max[0, ΔMTMLTV–10]	NA	0	NA	0	NA	0	NA	0
Max[0, ΔMTMLTV–20]	NA	0	NA	0	NA	0	NA	0
Max[0, ΔMTMLTV–30]	NA	0	NA	0	NA	0	NA	0
Credit Score	-0.00332	-0.00332	-0.00332	-0.00332	-0.00332	-0.00332	-0.00195	-0.00195
Max[0, Credit Score–580]	0	0	0	0	0	0	0	0
Max[0, Credit Score -660]	0	0	0	0	0	0	0	0
Max[0, Credit Score -720]	0	0	0	0	0	0	0	0
DTI_Start	0.025	0.025	0.025	0.025	0.025	0.025	0.045	0.045
Max[0, DTI_Start–36]	0	0	0	0	0	0	0	0
Max[0, DTI_Start -46]	0	0	0	0	0	0	0	0
Max[0, DTI_Start -61]	0	0	0	0	0	0	0	0
Ln(1+ ΔDTI)	NA	0	NA	0	NA	0	NA	0
ΔDTI = (DTI_Start – DTI_Modified)	NA	-0.2178	NA	-0.2178	NA	-0.2178	NA	-0.2927
Max[0, ΔDTI–5]	NA	0.1712	NA	0.1712	NA	0.1712	NA	0.2303
Max[0, ΔDTI–15]	NA	0.0217	NA	0.0217	NA	0.0217	NA	0.0174
Max[0, ΔDTI–30]	NA	0	NA	0	NA	0	NA	0

Default Model Parameters (for Non- Owner-Occupied Properties)

Variable	Current		D30		D60		D90+	
	Default	Redefault	Default	Redefault	Default	Redefault	Default	Redefault
Intercept	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-1.51	-1.51
MTM-LTV	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0.0255	0.0255
Max[0, MTMLTV –80]	0	0	0	0	0	0	0	0
Max[0, MTMLTV -100]	-0.01084	-0.01084	-0.01084	-0.01084	-0.01084	-0.01084	0	0
Max[0, MTMLTV -120]	-0.01448	-0.01448	-0.01448	-0.01448	-0.01448	-0.01448	-0.01309	-0.01309
Max[0, MTMLTV -150]	0	0	0	0	0	0	0	0
ΔMTMLTV=(MTMLTV_Start – MTMLTV_Modified)	NA	0	NA	0	NA	0	NA	0
Max[0, ΔMTMLTV–5]	NA	0	NA	0	NA	0	NA	0
Max[0, ΔMTMLTV–10]	NA	0	NA	0	NA	0	NA	0
Max[0, ΔMTMLTV–20]	NA	0	NA	0	NA	0	NA	0
Max[0, ΔMTMLTV–30]	NA	0	NA	0	NA	0	NA	0
Credit Score	-0.00332	-0.00332	-0.00332	-0.00332	-0.00332	-0.00332	-0.00195	-0.00195
Max[0, Credit Score–580]	0	0	0	0	0	0	0	0
Max[0, Credit Score -660]	0	0	0	0	0	0	0	0
Max[0, Credit Score -720]	0	0	0	0	0	0	0	0
DTI_Start	0.025	0.025	0.025	0.025	0.025	0.025	0.045	0.045
Max[0, DTI_Start–36]	0	0	0	0	0	0	0	0
Max[0, DTI_Start -46]	0	0	0	0	0	0	0	0
Max[0, DTI_Start -61]	0	0	0	0	0	0	0	0
Ln(1+ ΔDTI)	NA	0	NA	0	NA	0	NA	0
ΔDTI = (DTI_Start – DTI_Modified)	NA	-0.2178	NA	-0.2178	NA	-0.2178	NA	-0.2927
Max[0, ΔDTI–5]	NA	0.1712	NA	0.1712	NA	0.1712	NA	0.2303
Max[0, ΔDTI–15]	NA	0.0217	NA	0.0217	NA	0.0217	NA	0.0174
Max[0, ΔDTI–30]	NA	0	NA	0	NA	0	NA	0

C. Prepayment Tables

Prepayment Model Parameters (for Owner-Occupied Properties)

Category	Coefficient				Spline
	Current	D30	D60	D90+	
Intercept	-6.2459	-5.3613	-3.8399	-1.9662	1
12 Month HPI growth I	15.4936	10.0606	13.6551	16.6011	min(-0.08, hpag)
12 Month HPI growth II	-3.9628	-0.5064	-0.5626	-5.5936	max(-0.08, min(-0.04, hpag))-(-0.08)
12 Month HPI growth III	19.1228	23.7096	25.5205	26.5244	max(-0.04, min(0, hpag))-(-0.04)
12 Month HPI growth IV	6.9695	4.9242	1.8688	-0.2564	max(0, min(0.05, hpag))-0
12 Month HPI growth V	8.8245	8.8194	10.1779	10.2817	max(0.05, min(0.10, hpag))-(0.05)
12 Month HPI growth VI	-12.7696	-8.3876	-5.0194	-4.0629	max(0.10, hpag)-0.10
INCT I	0.5437	0.8761	0.8128	0.9148	min(-1.5, inct)
INCT II	0.2112	0.1488	0.4505	0.1083	max(-1.5, min(-1, inct))-(-1.5)
INCT III	0.5367	0.4115	0.0043	-0.1567	max(-1, min(0, inct))-(-1)
INCT IV	0.7603	0.2968	0.00136	-0.2999	max(0, min(0.5, inct))-0
INCT V	0.6601	0.346	0.0394	-0.0871	max(0.5, min(1, inct))-0.5
INCT VI	0.1036	0.051	-0.0782	-0.067	max(1.0, min(1.5, inct))-1.0
INCT VII	-0.0263	-0.0366	0.1112	-0.0352	max(1.5, min(2, inct))-1.5
INCT VIII	-0.0158	-0.0407	-0.0895	-0.0993	max(2.0, min(2.5, inct))-2.0
INCT IX	-0.00906	-0.0259	0.0803	0.00414	max(2.5, inct)-2.5
MTMLTV I	0.0026	-0.00347	-0.0112	-0.0207	min(50, mltv)
MTMLTV II	-0.015	-0.0216	-0.03	-0.0416	max(50,min(70, mltv)) - 50
MTMLTV III	-0.0158	-0.0197	-0.0299	-0.0454	max(70,min(80, mltv)) - 70
MTMLTV IV	-0.0284	-0.0311	-0.0446	-0.0627	max(80,min(90, mltv)) - 80
MTMLTV V	-0.0705	-0.0944	-0.0902	-0.0912	max(90,min(100, mltv)) - 90
MTMLTV VI	-0.0536	-0.0851	-0.0913	-0.0859	max(100,min(110, mltv)) - 100
MTMLTV VII	-0.0288	-0.0256	-0.024	-0.0114	max(110, mltv) - 110
Credit Score I	0.00171	0.00119	0.000615	0.000252	min(640, credit score)
Credit Score II	0.00253	0.00149	0.00111	0.00104	max(640, min(700, credit score)) - 640

Category	Coefficient				Spline
	Current	D30	D60	D90+	
Credit Score III	0.00155	0.005	0.00643	0.00668	max(700, min(760, credit score)) - 700
Credit Score IV	-0.00081	-0.00113	0.000716	0.00149	max(760, credit score) - 760
Original Amount I	0.0156	0.0137	0.0111	0.0109	min(80, amt)
Original Amount II	0.00581	0.00579	0.00508	0.00523	max(80, min(140, amt)) - 80
Original Amount III	0.00232	0.00229	0.00167	0.000974	max(140, min(220, amt)) - 140
Original Amount IV	-0.00001	-0.00013	-0.00122	-0.00101	max(220, min(300, amt)) - 220
Original Amount V	0.00102	0.000488	-0.00154	-0.00198	max(300, amt) - 300

Prepayment Model Parameters (for Non-Owner-Occupied Properties)

Category	Coefficient				Spline
	Current	D30	D60	D90+	
Intercept	-6.2459	-5.3613	-3.8399	-1.9662	1
12 Month HPI growth I	15.4936	10.0606	13.6551	16.6011	min(-0.08, hpag)
12 Month HPI growth II	-3.9628	-0.5064	-0.5626	-5.5936	max(-0.08, min(-0.04, hpag))-(-0.08)
12 Month HPI growth III	19.1228	23.7096	25.5205	26.5244	max(-0.04, min(0, hpag))-(-0.04)
12 Month HPI growth IV	6.9695	4.9242	1.8688	-0.2564	max(0, min(0.05, hpag))-0
12 Month HPI growth V	8.8245	8.8194	10.1779	10.2817	max(0.05, min(0.10, hpag))-(0.05)
12 Month HPI growth VI	-12.7696	-8.3876	-5.0194	-4.0629	max(0.10, hpag)-0.10
INCT I	0.5437	0.8761	0.8128	0.9148	min(-1.5, inct)
INCT II	0.2112	0.1488	0.4505	0.1083	max(-1.5, min(-1, inct))-(-1.5)
INCT III	0.5367	0.4115	0.0043	-0.1567	max(-1, min(0, inct))-(-1)
INCT IV	0.7603	0.2968	0.00136	-0.2999	max(0, min(0.5, inct))-0
INCT V	0.6601	0.346	0.0394	-0.0871	max(0.5, min(1, inct))-0.5

Category	Coefficient				Spline
	Current	D30	D60	D90+	
INCT VI	0.1036	0.051	-0.0782	-0.067	max(1.0, min(1.5, inct))-1.0
INCT VII	-0.0263	-0.0366	0.1112	-0.0352	max(1.5, min(2, inct))-1.5
INCT VIII	-0.0158	-0.0407	-0.0895	-0.0993	max(2.0, min(2.5, inct))-2.0
INCT IX	-0.00906	-0.0259	0.0803	0.00414	max(2.5, inct)-2.5
MTMLTV I	0.0026	-0.00347	-0.0112	-0.0207	min(50, mltv)
MTMLTV II	-0.015	-0.0216	-0.03	-0.0416	max(50,min(70, mltv)) - 50
MTMLTV III	-0.0158	-0.0197	-0.0299	-0.0454	max(70,min(80, mltv)) - 70
MTMLTV IV	-0.0284	-0.0311	-0.0446	-0.0627	max(80,min(90, mltv)) - 80
MTMLTV V	-0.0705	-0.0944	-0.0902	-0.0912	max(90,min(100, mltv)) - 90
MTMLTV VI	-0.0536	-0.0851	-0.0913	-0.0859	max(100,min(110, mltv)) - 100
MTMLTV VII	-0.0288	-0.0256	-0.024	-0.0114	max(110, mltv) - 110
Credit Score I	0.00171	0.00119	0.000615	0.000252	min(640, credit score)
Credit Score II	0.00253	0.00149	0.00111	0.00104	max(640, min(700, credit score)) - 640
Credit Score III	0.00155	0.005	0.00643	0.00668	max(700, min(760, credit score)) - 700
Credit Score IV	-0.00081	-0.00113	0.000716	0.00149	max(760, credit score) - 760
Original Amount I	0.0156	0.0137	0.0111	0.0109	min(80, amt)
Original Amount II	0.00581	0.00579	0.00508	0.00523	max(80, min(140, amt)) - 80
Original Amount III	0.00232	0.00229	0.00167	0.000974	max(140, min(220, amt)) - 140
Original Amount IV	-0.00001	-0.00013	-0.00122	-0.00101	max(220, min(300, amt)) - 220
Original Amount V	0.00102	0.000488	-0.00154	-0.00198	max(300, amt) - 300

Note: The values of the independent variables are bounded as follows:

- If “hpag” is less than -0.5 it is set equal to -0.5 and if it is greater than 0.5 it is set equal to 0.5
- If “inct” is less than - 5 it is set equal to - 5 and if it is greater than 3 it is set equal to 3
- If “mltv” is less than 40 it is set equal to 40 and if it is greater than 180 it is set equal to 180
- If “credit score” is less than 400 it is set equal to 400 and if it is greater than 800 it is set equal to 800
- amt = orig_amt/1000; If “amt” is less than 50 it is set equal to 50 and if it is greater than 500, it is set equal to 500

D. Tier 2 Waterfall Eligibility History

Eligibility for modification into HAMP Tier 2 has changed since its introduction in June 2012 as Treasury has changed the requirements for allowable DTI, P&I payment change, and interest rate premium. The Base NPV Model evaluates borrowers according to the policy in place as of their HAMP Tier 2 Evaluation Date (NPV Date). The following table summarizes the history of these Tier 2 waterfall requirements.

NPV Date Range		Waterfall Parameters		
Beginning Date	End Date	Rate Adjustment (BPS)	Allowable DTI Range	P&I Payment
June 1, 2012	January 31, 2013	50	25% - 42%	Minimum 10% reduction
February 1, 2012	June 30, 2014	50	10% - 55%	Minimum 10% reduction
July 1, 2014	December 31, 2014	0	10% - 55%	Must not increase
January 1, 2015	N/A	-50	10% - 55%	Must not increase