HOME AFFORDABLE MODIFICATION PROGRAM

BASE NET PRESENT VALUE (NPV) MODEL V4.03
MODEL DOCUMENTATION

Effective: September 30, 2011

Contents

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 will be used by servicers participating in the 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 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 calculation logic laid out in this document 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 no loan modification. 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 for no loan modification. 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 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 from Version 3.0 to Version 4.0

In response to servicer feedback and planned model enhancements, the following updates have been made to the base NPV model.

Principal Reduction Alternative (PRA) Program
- NPV changes related to the new program are outlined (p10-12)
- New input fields for NPV for the PRA program are added (p19-21)
- New output fields for NPV for the PRA program are added (p27-28)

Adjustment in REO Discount Structure
- Instead of providing REO Discount, a new specification to estimate REO sale value is used (p22-24)
- The estimated REO sale value continues to be adjusted based on Property Valuation Type (p24)

Prepayment Model Update (p38-41)
- The coefficients for the prepayment model have been adjusted and a new term has been added.
- The forbearance adjustment to the refinance incentive has been reformulated.

Default Model Update (p37-38)
- Spline terms have been added to the MTMLTV relationship

Servicing Fee exclusion from Investor Cashflow (p21)
- An interest-only (IO) strip is removed from the note rate and the discount rate in NPV calculation

Refined input fields data ranges for better data quality control
- Base NPV Input fields have more refined allowable ranges (p13-21)

Error codes changes (p28-31)
- New error codes : 60-71 and h-l
- Removal of existing error codes: 7, 8, 9, 20, 34, 35, 36, 47, 55, 58, c, f
- Error code enhancements: 21, 33, 40, 41, 42, 49, 53, 54, b
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Output fields changes (p27-28)
- Forbearance Flag no longer in use
- Additional output fields for PRA

Option for NPV re-coders to introduce their own default models will be phased out (p43)

Additional guidance from MHA-C on NPV compliance requirement for servicers (p44-46)

Clarification to the Model Documentation from Version 3.0 to Version 4.0

- **Timing of HPDP incentive payment (in the equations for Mod Cure and Mod Default cash flows):** The accrued but unpaid HPDP incentive payments will be payable on the payment date in the month in which the loss of good standing or payoff is reported.
- **Adjustable-Rate Mortgage (ARM) Resets are now calculated in 120 days instead of 4 months from data collection date.**
- **Monthly Payment used for incentive, eligibility and waterfall determination should be the same for ARM loans resetting within 120 days:** For non-GSE loans, monthly payment is the fully amortizing monthly mortgage payment based on the note reset rate using the index value as of the date of the evaluation. For GSE loans, monthly payment is the current monthly payment.

Changes from V4.0 to V4.03

- Effective with v4.03, the waterfall test and PRA Waterfall Test will include an out-of-sequence operation in the waterfall check (p26-27)
- **Timing of NPV cash flows clarification:** In prior versions of the Base NPV Model Documentation, the timing of the cash flows is implied to start at the point of the Data Collection Date. This implication can be construed from the model equations. Base NPV Model Documentation v4.03 makes it explicitly clear that the underlying assumption of the NPV model is that the cash flows of the modification starts at Data Collection Date, not at the estimated modification effective date. (p20)
- **Clarification for Definition of the input field AC- Months Past Due:** The definition is updated to align with the definition under MBA. (p17)

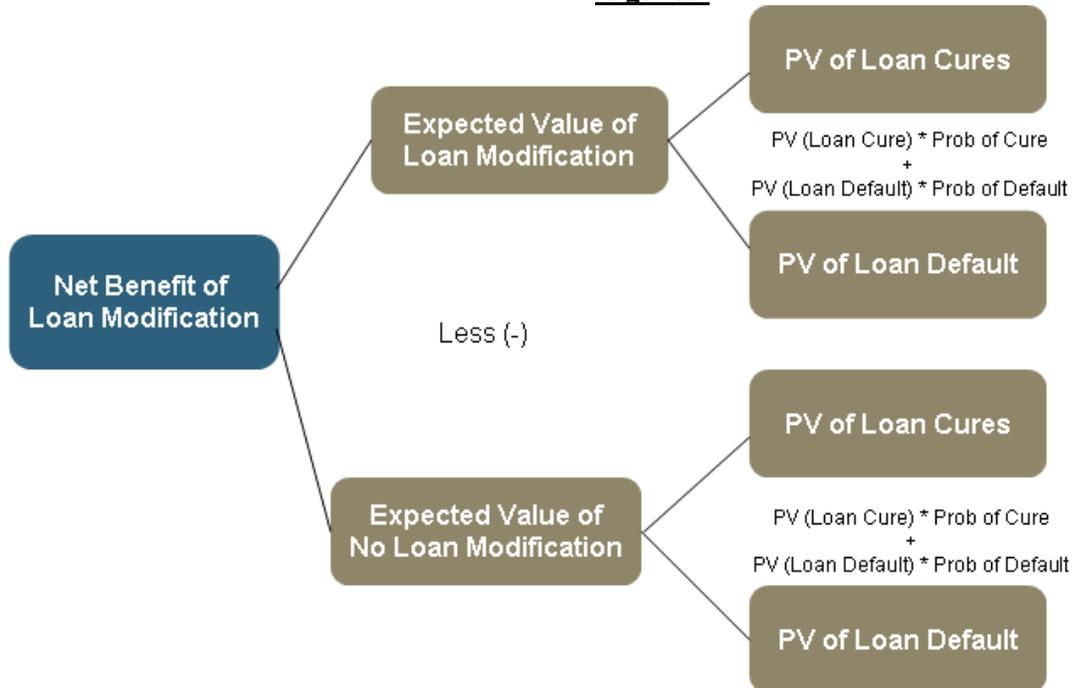### III. Considerations for Cash Flows in the Base NPV Model

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 a loan that is not modified
2. Probability of default for a loan that is not modified
3. Probability of cure for a modified loan
4. Probability of default for a modified loan

Figure 1

Net Benefit of Loan Modification

Expected Value of Loan Modification

PV of Loan Cures

PV (Loan Cure) * Prob of Cure
+
PV (Loan Default) * Prob of Default

PV of Loan Default

Less (-)

Expected Value of No Loan Modification

PV of Loan Cures

PV (Loan Cure) * Prob of Cure
+
PV (Loan Default) * Prob of Default

PV of Loan Default

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 provide the input 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.

Incentive Payments Included in the Base NPV Model Calculation

Payment Reduction Cost Share for Investor
For every month the borrower is in good standing under HAMP, 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% debt to income ratio (DTI)[1] ratio 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 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.
   Payment Reduction Cost Share Incentive = 50% [MIN(38% or current DTI) – 31% DTI]

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

$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.

Borrower Pay-for-Performance Success Payments
Borrowers who make timely monthly payments are eligible to accrue up to $1,000 of reduction in principal each year for five years, or a maximum total of $5,000 over five years, in the HAMP. The borrower's mortgage payment must be made on time in order to accrue the monthly Pay-for-Performance Success 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 a year for five

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[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.

years, provided the borrower remains eligible. The payment will be calculated as the lesser of (i) $1,000 ($83.33/month), or (ii) one-half of the reduction in the borrower's annualized monthly payment to the 31% DTI payment.

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

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 is effective beginning 9/1/2009, and loans tested for modification eligibility on or after that date may qualify for HPDP payments.

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 MSA and unpaid principal balance (UPB) quintile. The quarter for which the payment is used in the NPV calculation is set on the "NPV Date" – the date the loan was submitted through the NPV model to determine trial modification eligibility. The "NPV Date" is an input to the NPV submission spreadsheet on the portal.

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

(i)   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;
(ii)   The UPB of the mortgage loan prior to modification under HAMP; and
(iii)   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 MTM-LTV 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 for which the loan is attributed to.

MTM-LTV	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 1/24th 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[2] 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
To qualify for the $1,500 Non-delinquency Modification Incentive payment to investors, the $1,000 borrower Pay-for-Performance Success 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 current PITIA payment. (There is no de minimis test to be eligible for the Payment Reduction Cost Share.)

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

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, 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 and propose a partial claim payment as well as 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 mark-to-market loan to value (MTMLTV) ratio of greater than 115% under both the standard waterfall and a PRA alternative waterfall. Beginning with version 4.0, the base NPV model will calculate the net present value of the modification under the standard HAMP waterfall as well as the alternative waterfall.

PRA Alternative Waterfall

Under the Alternative Waterfall, servicers use principal reduction between Step 1 (capitalization) and Step 2 (interest rate reduction) of the Standard Waterfall set forth in Chapter II, Section 6.3 of the Making Home Affordable (MHA) Handbook as follows.

Step 1:
Reduce the UPB by an amount necessary to achieve either the target monthly mortgage payment ratio of 31% or a MTMLTV ratio equal to 115%, whichever is reached using the lesser amount of principal reduction. Servicers are allowed to reduce principal below 31% DTI or below 115% MTMLTV; however, principal reductions that bring the MTMLTV below 105% will not be eligible for incentives.

Step 2:
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 current loan term and using the current mortgage interest rate; if the loan is an ARM resetting within 120 days, use reset rate[3]), continue with the standard HAMP modification waterfall steps of

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[3] If the ARM/IO loan *will* reset or recast in next 120 days:

interest rate reduction, term extension and principal forbearance, each as necessary, until the target monthly mortgage payment ratio of 31% is achieved.

If the NPV result for the proposed modification generated by applying the Standard Waterfall is positive, servicers must modify the loan. If the NPV result for the proposed modification generated by applying the Alternative Waterfall is positive, servicers are encouraged, but are not required, to perform a HAMP loan modification utilizing PRA, even in instances where the NPV result from the Standard Waterfall is negative or is less than the NPV result generated by application of the Alternative Waterfall. If neither the Standard Waterfall NPV nor the Alternative Waterfall NPV is positive, the servicer is not required to modify the loan.

Application of PRA and Incentives

The principal reduction amount under PRA will be initially placed in non-interest bearing PRA forbearance and 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[4] 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

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 $0.21 per dollar of principal reduction equal to or greater than 105% and less than 115% MTMLTV; $0.15 per dollar of principal reduction equal to or greater than 115% and less than or equal to 140% MTMLTV; and $0.10 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%
$0.21	$0.15	$0.10

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, investors will be

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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.

[4] 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 4 months from the NPV Date; 5 months for current Fannie Mae loans.

paid $0.06 per dollar of principal reduction and will not be eligible for incentives in the above extinguishment schedule.

Example: A loan 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 $.10/dollar; from 140%-115% MTMLTV, investors get $.15/dollar; from 115%-105% MTMLTV, investors get $.21/dollar; and less than 105% MTMLTV, investors do not get any incentives.

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 percent to 31 percent 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. The servicer 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 two scenarios: 1) no modification, 2) modification under HAMP (with and without principal reduction, where applicable). The model uses the following inputs in its equations:

   a) "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).
   b) "Servicer Defined Inputs" – Servicer input of the risk premium, modification fees, and mortgage insurance partial payment amount (columns AH-AJ from the table below).
   c) The terms of the proposed modification under the standard waterfall (columns AK-AP from the table below).
   d) The terms of the proposed modification under the Principal Reduction Alternative waterfall (columns AS–AX from the table below)

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
E	**Data Collection Date**	The date on which the UPB and associated remaining term data was collected.	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 12/31/1960 and 03/01/2009
H	**Unpaid Principal Balance at Origination**	The face value on the note at origination (i.e., the amount borrowed by the mortgagor). Report 2 decimal places.	Number(2)	Greater than 0
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.	Integer	Optional -Greater than 0
J	**Interest Rate at Origination**	The interest rate of the loan at origination. Report 5 decimal places.	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 general classification of the loan.	Enumerated List[5]	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)

[5] 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).

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, the use current note rate before modification.	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. 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 current payment information (i.e., UPB) was reported as of 4/30/09. Remaining terms for this loan is (360-12 = 348).	Integer	Greater than 0
P	Unpaid Principal Balance Before Modification	The unpaid balance as of the last paid installment date. Does not include arrearage. Report 2 decimals.	Number(2)	Greater than 0
Q	Interest Rate Before Modification	The interest rate on the loan before the modification. 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 principal and interest payments before modification. 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 current scheduled payment should be reported, not the payment at the LPI date. Report 2 decimals.	Number(2)	Greater than 0

S	**Current Borrower Credit Score**[6]	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
V	**Property - State**	The two letter state code of the property.	Enumerated List[7]	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**	Monthly HOA or condo fees; also include any future monthly escrow shortage.	Number(2)	Greater than or equal to 0
X	**Monthly Hazard and Flood Insurance**	Monthly hazard and flood insurance coverage amount.	Number(2)	Greater than or equal to 0
Y	**Monthly Real Estate Taxes**	Monthly real estate taxes.	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**	Property value collected through an AVM, BPO, or appraisal.. Report 2 decimals.	Number(2)	Greater than 10

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[6] 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.

[7] 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 Virgin Island are territories and are in the code.

AB	Mark-to-Market LTV	Current UPB divided by current property value. Truncate the value to 5 decimal places. Do not round. For example, for MTM-LTV =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 MTM-LTV =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. Report 2 decimals.	Number(2)	Greater than or equal to 0
AG	Imminent Default Flag	If a current or 30-day delinquent borrower is considered in imminent default, then this flag	Character (Boolean)	Y/N

		receives the value "Y." Otherwise, it receives the value "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 plus interest arrearage, taxes, insurance, HOA amounts, and other costs capitalized at the time of the modification, less forbearance and any principal reduction amounts. Report 2 decimals.	Number(2)	Greater than or equal to 0
AL	**Interest Rate After Modification**	The interest rate on the loan in the month after modification. Report 5 decimals.	Percent(5)	Greater than 0 and less than or equal to 25.00000%.
AM	**Amortization Term After Modification**	The amortization period of the loan after modification. Reported in months. This period includes the term extension as defined in the HAMP modification waterfall.	Integer	Greater than 0
AN	**Principal and Interest Payment after Modification**	The sum of the principal and interest payments in the month after the modification. Report 2 decimals.	Number(2)	Greater than 0
AO	**Principal Forbearance Amount**	The amount of principal forbearance applied at the modification. Report 2 decimals.	Number(2)	Greater than or equal to 0
AP	**Principal Forgiveness Amount**	The amount of principal forgiveness applied at the modification. Report 2 decimals.	Number(2)	Greater than or equal to 0
AQ	**Property Valuation Type**	A code that denotes the type of estimate of the value of the real	Enumerated List	1 – AVM 2 – Exterior BPO /

		estate property.		Appraisal (as is value) 3 – Interior BPO / Appraisal (as is value)
AR	**NPV Date**	Date of the NPV submission used to determine trial modification eligibility. This should be the same NPV Date reported for the trial modification setup. Use today's date if submitting the loan for the first time.	Date	Valid date must be greater than or equal to 4/15/09 but not after current date
AS	**PRA Waterfall - Unpaid Principal Balance After Modification (Net of PRA Forbearance & PRA Principal Reduction)**	**Principal Reduction Alternative (PRA) Waterfall -** 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. Report 2 decimals.	Number(2)	Conditionally Required - If 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 -** The interest rate on the loan in the month after modification. Report 5 decimals.	Percent(5)	Conditionally Required - If 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 -** The amortization period of the loan after modification. Reported in months. This period includes the term extension as defined in the HAMP modification waterfall.	Integer	Conditionally Required - If post-arrearage MTMLTV >115% or if PRA Waterfall-Principal Forgiveness >0. Greater than 0
AV	**PRA Waterfall - Principal and Interest Payment after Modification**	**Principal Reduction Alternative (PRA) Waterfall -** The sum of the principal and interest payments in the month after the modification. Report 2 decimals.	Number(2)	Conditionally Required - If 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 -** The amount of principal forbearance applied at the modification. Report 2 decimals.	Number(2)	Conditionally Required - If post-arrearage MTMLTV >115% or if PRA Waterfall-Principal Forgiveness >0. Greater than or

				equal to 0.
AX	**PRA Waterfall - Principal Forgiveness Amount**	**Principal Reduction Alternative (PRA) Waterfall -** The amount of principal forgiveness applied at the modification. Report 2 decimals.	Number(2)	Conditionally Required - If post-arrearage MTMLTV >115%. Greater than or equal to 0
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).

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

- **Discount Rate Risk Premium** – Default value is the weekly Freddie Mac Primary Mortgage Market Survey (PMMS) weekly rate for 30-year fixed-rate conforming loans. Servicer can override the default discount rate by adding a risk premium of no more than 250 basis points to the PMMS weekly rate. With respect to loans that are not owned or guaranteed by Fannie Mae or Freddie Mac, the servicer may apply a maximum of two discount rates, one for loans in its own portfolio and another for loans serviced for investors. With respect to loans owned or guaranteed by Fannie Mae or Freddie Mac, the servicer must follow Fannie Mae and Freddie Mac guidance.
- **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 agrees to pay subsequent to a negative NPV and MI insurer review, if this choice is made.

Base NPV Model Assumptions
- **Timing of NPV Cashflow** – All loans that meet HAMP eligibility must be evaluated using the NPV model prior to becoming a permanent mod. 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 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 Cashflow** – HAMP NPV version 3.0 did not remove servicer fees from the note rate[8] and assumed that the entire interest amount paid by the

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[8] Note rate is the Interest Rate before Modification

borrower is passed through to the investor. In NPV version 4.0, servicing fees are 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 current UPB of $100,000. The current 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 four key indicators:
  - Credit quality of the borrower(s);
  - MTM-LTV of the home at the time of modification;
  - Timing of the modification (earlier or later in the delinquency cycle); and
  - Front-end DTI ratio before and after modification.
  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.
- **Imminent Default Loans** – Current loans and loans that are delinquent 59 days or less that are flagged as "imminent default" are treated as if they have the default and re-default probabilities of loans that are 60 days or more delinquent.
- **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:
  - MTM-LTV 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 current 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, 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.

-- **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 version 4.0, 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 version 4.0 includes: (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 version 4.0, 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

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

$I_{\$50k<PropValue \leq \$100k}$ = 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[9] Marked Forward to the estimated Disposition Date[10]

β = coefficient values

- The coefficients 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[11] 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 β_{0s}	<=50k indicator β_{1s}	50k<=100k indicator β_{2s}	PropValue β_{3s}	<=50k indicator * PropValue β_{4s}	50k<=100k indicator * PropValue β_{5s}
State 1	-12,606	7,629.11	-18,262.2	0.8435	-0.4019	0.4510

- If the value of the home is $75,000[11], 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 $200,000[11] 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, if you have 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

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[9] 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.

[10] 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.

[11] 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.

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%)).

- **Home Price Projection**
  - A 110 local markets (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 two 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.
- **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

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    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 Check (see Section VI) and NPV Results. The Waterfall Check is an indicator to the servicer as to whether the modification terms fall within the guidelines of the HAMP. The proposed terms of the modification 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 Check

- **Waterfall Test (Y/N)** – The Waterfall Check compares the modified loan terms and forbearance provided by the servicer with those calculated by the NPV model. The result of the Waterfall Check 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 the 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 current remaining term is greater than 480 months, the Amortization Term After Modification must equal current remaining terms.
  - Forbearance amount must be within $1,000 of the amount calculated by the Base NPV model.

  Effective with v4.03, the waterfall test will include an out-of-sequence operation in the waterfall check :
  - 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 Check 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 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. Minimum rate is 2%.
  - PRA- Amortization Term After Modification must be within 12 months of the term calculated by the Base NPV model. If the current remaining term is

greater than 480 months, then the Amortization Term After Modification must equal current remaining terms.

– PRA-Forbearance amount must be within $1,000 of the amount calculated by the Base NPV model.

Effective with v4.03, an additional test checks if there is an out-of-sequence operation in the PRA waterfall calculation:

– 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 Success Payments – at least 6% reduction in monthly PITIA payment. Also, whether the Pay-for-Performance Success Payments are no larger than half the reduction in the borrower's annualized monthly payment to the borrower's 31% DTI payment.

- **Forbearance Flag (Y/N) –** This flag is no longer in use per the MHA Handbook. User will see a dash "-" for this field beginning with Base NPV model version 4.0.

2. NPV Results
   - **HAMP Servicer Loan Number**
   - **Servicer Loan Number** – Unique loan number
   - **NPV Value No Mod –** NPV value of not modifying the loan
   - **NPV Value Mod –** NPV value of modifying the loan
   - **NPV Test–** Result of the NPV test (Positive/Negative). Positive means the NPV Value Mod is greater than or equal to NPV 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, NPV values will not be available – please correct the data and resubmit.
   - **Run Date –** Date the NPV test was run
   - **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.
   - **PRA - NPV Value No Mod –** NPV value of not modifying the loan using the PRA waterfall
   - **PRA - NPV Value Mod –** NPV value of modifying the loan using the PRA waterfall

- **PRA - NPV Test**– Result of the NPV test under the PRA Waterfall (Positive/Negative). Positive means the PRA-NPV Value Mod is greater than or equal to PRA-NPV Value No Mod.

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 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 Monthly Gross Income
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

NPV Run Successful? "N" Error Code	DESCRIPTION
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
55	Error 55 no longer used
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
62	Principal Forgiveness amount is less than 0
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
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
69	PRA Waterfall - Principal Forgiveness amount is less than 0 or missing

NPV Run Successful? "N" Error Code	DESCRIPTION
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
a	Ineligible for HAMP mod - Current DTI already below 31%
b	Monthly Taxes & Insurance and Associations Fees > 31% of Monthly Gross Income
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 mod - 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 mod, 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

Subsidy Ineligibility

There are four scenarios in which the modified loan is ineligible for subsidy.

1. If the borrower is not current at the end of the trial period.
2. If the new payment at 31% DTI is not at least 6% lower than the current payment, the loan is not eligible for the $1,500 investor initiation incentive, the $1,000 per year servicer pay-for-success incentive, the $1,000 per year borrower Pay-for-Performance Success Payment, or the Home Price Decline Protection incentive. However, the investor is entitled to the Payment Reduction Cost Share.

3. If the NPV for the modification is negative and the investor does not want to continue with the HAMP program, the loan is not eligible for program subsidy.
4. If the NPV for the modification is negative, the forbearance amount has already reduced the interest-bearing UPB to the market value of the property, and the loan has not achieved 31% DTI, the loan is not eligible for program subsidy.

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:

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

where p is the lifetime default probability.[12]

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 the approach we take is 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:

$$P\&I\ Arrearage \approx MDLQ(P + I)$$

Hence,

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

where:
MDLQ – Months delinquent
T – Remaining term [13]
δ – Monthly discount rate
UPB – Unpaid principal balance [14]
P – Principal
I – Interest (net of servicing fee)
SMM_k – Single month mortality (SMM) in month k [15]

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[12] Default equations are defined at the end of this section.
[13] The remaining term includes the trial period.
[14] Note that the notation assumes that UPB_0 is equal to the UPB amount after delinquent loans have been cured.
[15] SMM equations are defined at the end of this section.

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. [16]

2. No Mod: NPV{Loan Defaults}
The model utilizes a simplified approach to the timing of default. For the non-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.

$$\text{Months to FCL} = \text{Max (1, Average State Level FCL timeframe} - \text{MDLQ)}$$
$$S \equiv \text{Months to REO Sales} = \text{Months to FCL} + \text{Average State Level REO timeframe} \ [17]$$

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 current UPB before modification.
b. **Settlement Charges** – State-level charges as a percentage of the gross REO sales proceeds, including broker fees.
c. **MI Proceeds** [18, 19]
    =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: [20]

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[16] It is equal to UPB_0 in the cash flow model above.

[17] 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.

[18] The servicer may choose to exclude MI coverage with investor consent. The 15% gross-up of UPB approximates accrued interest and foreclosure costs.

[19] For the loan modification case, the relevant UPB will be the post-modification UPB that includes arrears.

$$NPDV = (\text{Net REO Sale Proceeds}) - \text{Foreclosure/Disposition Costs} + \text{MI Proceeds}$$

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.

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

$$+ \frac{II_1}{(1+\delta)^3}\prod_{k=1}^{2}(1-SMM_k) + \frac{(3*GS_4)}{(1+\delta)^4}\prod_{k=1}^{3}(1-SMM_k) + \sum_{j=1}^{5}\left\{\frac{M}{(1+\delta)^{(12*j)}}\prod_{k=1}^{12*j-1}(1-SMM_k)\right\}$$

$$+ \left[\frac{\frac{1}{12}*0.5*HPDP}{(1+\delta)}\right]SMM_1 + \sum_{j=2}^{11}\left\{\left[\frac{\frac{j}{12}*0.5*HPDP}{(1+\delta)^j}\right]SMM_j\left(\prod_{k=1}^{j-1}(1-SMM_k)\right)\right\}$$

$$+ \left[\frac{0.5*HPDP}{(1+\delta)^{12}}\right]\left(\prod_{k=1}^{11}(1-SMM_k)\right)$$

$$+ \sum_{j=13}^{23}\left\{\left[\frac{\frac{(j-12)}{12}*0.5*HPDP}{(1+\delta)^j}\right]SMM_j\left(\prod_{k=1}^{j-1}(1-SMM_k)\right)\right\} + \left[\frac{0.5*HPDP}{(1+\delta)^{24}}\right]\left(\prod_{k=1}^{23}(1-SMM_k)\right)$$

$$+ \sum_{j=1}^{3}\left\{\frac{A/3}{(1+\delta)^{(12*j)}}\prod_{k=1}^{12*j}(1-SMM_k)\right\} + \sum_{j=4}^{36}\left\{\frac{A}{(1+\delta)^j}\Phi_j SMM_j\prod_{k=1}^{j-1}(1-SMM_k)\right\}$$

$$- Mfee + MIPartialClaim + \left[\frac{F}{(1+\delta)^T}\right]\prod_{k=1}^{T}(1-SMM_k)$$

where:

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

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

M = Borrower incentive paid for five years at the end of each year if the loan is current. It is the lesser of $1,000 or half the reduction in the borrower's annualized monthly payment to the borrower's 31% DTI payment.

GS_i – Government Subsidy

$GS_i = 0.5*[\text{Min}(PAY_{DTI=38}, PAY_{DTI\_START}) - PAY_{DTI=31}]$ for $4 \leq i \leq 60$

Otherwise $GS_i = 0$

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[20] We cap the NPDV so that NPDV = Current UPB + MI Proceeds in cases where NPDV > (Current UPB + MI Proceeds).

Note that in the fourth month, a government subsidy payment is made for the trial period. This is contingent on the successful completion of the trial period. We denote this payment as $3*GS_4$ because it covers the three months of the trial period.[21]

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%.

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

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 unpaid principal balance (UPB) of the loan prior to modification.[22]

(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.

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[21] Fannie Mae current loans require a four month trial period and the payment would be denoted as 4*GS$_5$.
[22] Details on the UPB quintile thresholds are provided in Exhibit D of the MHA Handbook.

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

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

F – Forbearance amount that is ballooned without interest.

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 mod, 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 mod, 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.

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

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

$$PV\{Default\} = \left[\sum_{i=1}^{6} \frac{1}{(1+\delta)^i} \left\{ [UPB_{i-1} - P_i + F][\prod_{k=1}^{i-1}(1-SMM_k) - \prod_{k=1}^{i}(1-SMM_k)] + [P_i + [I_i + GS_i]]\prod_{k=1}^{i-1}(1-SMM_k) \right\} \right]$$

$$+ \frac{II_1}{(1+\delta)^3} \prod_{k=1}^{2}(1-SMM_k) + \frac{(3*GS_4)}{(1+\delta)^4}\prod_{k=1}^{3}(1-SMM_k)$$

$$+ \left[\sum_{j=7}^{S+6}\left[\frac{-C}{(1+\delta)^j}\right] + \frac{NPDV - MIPartialClaim}{(1+\delta)^{S+6}}\right]\prod_{k=1}^{6}(1-SMM_k)$$

$$+ \left[\frac{\frac{1}{12}*0.5*HPDP}{(1+\delta)}\right]SMM_1 + \sum_{j=2}^{6}\left\{\left[\frac{\frac{j}{12}*0.5*HPDP}{(1+\delta)^j}\right]SMM_j\left(\prod_{k=1}^{j-1}(1-SMM_k)\right)\right\}$$

$$+ \left[\frac{\frac{8}{12}*0.5*HPDP}{(1+\delta)^8}\right]\left(\prod_{k=1}^{6}(1-SMM_k)\right)$$

$$+ \sum_{j=4}^{6}\left\{\frac{A}{(1+\delta)^j}\ SMM_j\prod_{k=1}^{j-1}(1-SMM_k)\right\} - Mfee + MIPartialClaim$$

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 and third terms define incentive payments. The fourth 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. The variables determining default probability are the current mark-to-market LTV (MTM-LTV) 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. Loan modification lowers the DTI and affects the default prediction of the model through a payment relief term specified as the difference between the original DTI and the program target DTI of 31%. Predicted default rates increase with higher MTM-LTV levels, lower credit scores, and higher original DTI levels. The model specifies a linear spline in the MTM-LTV levels which allows the slope of the LTV curve to change at different levels of MTM-LTV (i.e., at the "knot" points, which in this implementation are located at 80, 100, and 120 LTV). Predicted re-default rates do not increase monotonically with original 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 D30, D60, and D90 equations.

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+). Current loans and loans that are delinquent 59 days or less that are flagged as "imminent default" are treated as if they have the default and re-default probabilities of loans that are 60 days or more delinquent.

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

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

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

$$\begin{aligned} Z_{DLQ} = & \beta_{0DLQ} + \beta_{1DLQ} * MTM\_LTV + \beta_{2DLQ} * \max\{MTM\_LTV-80, 0\} + \\ & \beta_{3DLQ} * \max\{MTM\_LTV-100, 0\} + \beta_{4DLQ} * \max\{MTM\_LTV-120, 0\} + \\ & \beta_{5DLQ} * CREDIT\ SCORE + \beta_{6DLQ} * DTI\_START + \\ & \beta_{7DLQ} * LN(DTI\_START-(DTI\_MODIFIED-1)) * REDEF\_IND \end{aligned}$$

where:
MTM_LTV = Mark-to-market LTV; value ranges from 0 to 999.99999 (of the first lien but not junior liens). Calculate MTMLV by dividing the current UPB before modification by Property Valuation-As-Is and then multiply by 100. 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 and co-borrower)
DTI_START = Front-end ratio before the modification, must be 31 or above; value ranges from 0 to 100
DTI_MODIFIED = Front-end ratio after the modification; value ranges from 0 to 100
REDEF_IND = Binary indicator set to 1 for calculating the re-default probability and set to 0 for default probability
β - coefficient values

Default probabilities should be calculated based on the MTMLTV and DTI including PRA principal reduction. We assume the full impact of the principal reduction upfront, because the borrower will receive the principal reduction in all cases except default.

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 First American 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:

$$SMM_k = \text{Exp}(P_k) / (1 + \text{Exp}(P_k))$$

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 modifications 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] marked-to-market LTV (MTMLTV)[25], current credit score, and original loan amount (Loan_Amt). The predictor, P_k, is specified as

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

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

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

where:
WAC = Current note rate or the modified note rate
UPB(t) = The total unpaid principal balance of the loan at time
F = Principal forbearance
PMMS = Effective Refinancing Rate, i.e., Freddie Mac's PMMS weekly rate for 30-year fixed-rate conforming loans

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 $1,000 in annual principal reduction upon performance (or half the reduction in the borrower's annualized monthly payment, if lower). In rate terms, this adjustment is given by:

$$adj_1(t) = \sum_{j=1}^{5} \frac{k(t, j) * M}{(1 + \delta)^{(12*j-t)}} \frac{1}{UPB(t)} \frac{1}{m}$$

Where *t* is number of months the loan has been in the modification, M is the Borrower Pay-for Success incentive paid for five years at the end of each year if the loan is current. It is the lesser of $1,000 or half the reduction in the borrower's annualized monthly payment. This incentive

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[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 marked-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.

adjustment is also contingent upon the modification meeting the de minimis test. $k(t, j) = 1$ 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.

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

Category	Coefficient				Spline
	Current	**D30**	**D60**	**D90+**	
Intercept	-6.77290	-4.79850	-4.45460	-1.37050	1
12 Month HPI growth I	23.33620	8.15460	13.89710	18.94080	min(-0.08, hpag)
12 Month HPI growth II	-11.32990	6.66340	4.51430	-2.02320	max(-0.08, min(-0.05, hpag))-(-0.08)
12 Month HPI growth III	12.49740	20.22000	23.77220	23.98950	max(-0.04, min(-0.00, hpag))-(-0.04)
12 Month HPI growth IV	10.71230	5.06520	1.06880	-3.18550	max(-0.00, min(0.05, hpag))-(-0.00)
12 Month HPI growth V	4.34290	7.02440	9.31150	10.82550	max(0.05, min(0.10, hpag))-(0.05)
12 Month HPI growth VI	-12.44470	-7.73590	-4.31290	-3.98380	max(0.10, hpag)-0.10
INCT I	0.57560	1.39320	0.55020	1.41200	min(-1.5, inct)
INCT II	0.01380	0.20490	0.48820	0.15700	max(-1.5, min(-1, inct))-(-1.5)
INCT III	0.81380	0.34720	0.02950	0.02000	max(-1, min(0, inct))-(-1)
INCT IV	1.61470	0.47370	0.01570	0.01870	max(0, min(0.5, inct))-0
INCT V	1.11900	0.34910	-0.00916	0.01410	max(0.5, min(1, inct))-0.5
INCT VI	0.18150	0.01280	0.07280	0.00800	max(1.0, min(1.5, inct))-1.0
INCT VII	-0.05330	0.04680	0.11730	0.00000	max(1.5, min(2, inct))-1.5
INCT VIII	-0.15510	-0.06170	-0.04060	0.00000	max(2.0, min(2.5, inct))-2.0
INCT IX	-0.10370	-0.01330	0.06170	0.00000	max(2.5, inct)-2.5
MTMLTV I	0.00300	-0.00186	-0.00849	-0.01790	min(50,mltv)
MTMLTV II	-0.00765	-0.01870	-0.02620	-0.03710	max(50,min(70, mltv)) - 50
MTMLTV III	-0.02960	-0.01950	-0.02820	-0.04450	max(70,min(80, mltv)) - 70
MTMLTV IV	-0.00812	-0.02140	-0.03670	-0.06390	max(80,min(90, mltv)) - 80
MTMLTV V	-0.08470	-0.10940	-0.07190	-0.08210	max(90,min(100, mltv)) - 90
MTMLTV VI	-0.07160	-0.09980	-0.11430	-0.09160	max(100,min(110, mltv)) - 100
MTMLTV VII	-0.04340	-0.04320	-0.03530	-0.02940	max(110, mltv) - 110
Credit Score I	0.00340	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	0.01580	0.01320	0.01300	0.01150	min(80, amt)
Original Amount II	0.00683	0.00603	0.00430	0.00560	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, mtmltv=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. Requirements for Customization and Implementation of the Base NPV Model by Servicers

Servicers with at least a $40 billion servicing book may choose to build and implement proprietary NPV models for use in the HAMP or to implement the base model on their own systems. Servicer-developed and implemented NPV models must adhere to the guidelines and framework outlined in this document. Servicers must use standard model inputs for the following variables:

- Discount Rate – The current Freddie Mac PMMS weekly rate for 30-year fixed-rate conforming loans; the servicer may choose to add a risk premium of up to 250 bps. With respect to loans that are not owned or guaranteed by Fannie Mae or Freddie Mac, the servicer may apply a maximum of two discount rates, one for loans in its own portfolio and another for loans serviced for investors. 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 the discount rate applied to the no-modification cash flow will be the same as that applied to the modification cash flow.
- Prepayment Rate – See the Base Model Equations section. The prepayment rate for loans with modification or without modification is calculated based on a variety of parameters. The key variables are:
    – Mark-to-market loan-to-value ratio (MTM-LTV) 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
- REO Discount /REO Sale Value specification beginning with Base NPV model version 4.0. Servicer must use the REO discount table/REO Sale Value specification and adjustment based on valuation type used by the base NPV model.
- Home Price History and Projection – Servicers must use the 110 MSA/region level home price history and projection used by the base NPV model.
- Foreclosure & REO Disposition Times Lines – Servicers must use the state level Foreclosure & REO Disposition Timelines table used by the base NPV model.
- Foreclosure & REO Expenses and Settlement Charges – Servicers must use the state level Foreclosure & REO Expenses and Settlement Charges table used by the base NPV model.
- Post-modification time to re-default – the base NPV model assumes re-default will occur six months after modification. This includes performance during the three-month trial period and in the subsequent three months. The loan then becomes 30 days delinquent at month seven and 90 days delinquent at month nine.
- Model version control – Each major model version, as defined by www.HMPadmin.com, must be maintained so that borrowers are tested and retested on only one model version. All models must access market inputs from the date of the borrower's first NPV test.

Foreclosure timelines and costs, REO Discount/REO Sale Value, and home-price projection are used to calculate the property value in the no-modification and modification default scenarios. These calculations are provided under *Base Model Equations* in Section IV above.

The prepayment rate model applied in the base NPV model calculations is detailed in the *Base Model Equations* section.

Servicer-Specific NPV Model Inputs

Servicers planning to apply to use proprietary default models must notify Treasury and submit a complete application before December 2010. Servicers in remediation with MHA-C will not be permitted to implement a proprietary default model. In order for a servicer to be considered cleared of their NPV remediation, the following must all be true:

1. All NPV audit findings requiring a management response must have been addressed and cleared by MHA-C.

2. The servicer has no outstanding documentation requests.

3. The servicer has no algorithm errors as evidenced by a clean execution of all required tests.

4. The servicer has completed any required research and re-solicitation of negatively impacted borrowers.

5. Notification has been issued by MHA-C that the servicer has been cleared of its NPV remediation.

Model Versioning Requirements

Servicers 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.

Servicers also should use the same economic parameters and discount rate that were used for the trial modification eligibility run. This includes the Freddie Mac PMMS weekly rate, REO Discount rate/REO Sale value beginning with version 4.0, Home Price Index, Home Price Decline Payment table, and Foreclosure/REO Timeline and Cost table.

Test Consistency Requirements

Servicers should keep as much borrower information constant between tests as possible. The only NPV inputs that should be updated when the borrower is retested are those that were incorrect on the date of the initial NPV evaluation and have since been corrected based on the borrower's income documentation. Inputs that have changed in the interim but were correct on the date of the initial NPV evaluation should be held constant.

In the version of the NPV model available at www.HMPadmin.com, servicers should not change the "Data Collection Date" or the associated UPB and remaining term information for retests. This information should be reported for the retest as it was in the initial NPV evaluation.

Ensure that all NPV inputs remain constant when the borrower is retested, except
> (i)   those that were found to be incorrect at the time of the initial NPV evaluation and
> (ii)   inputs that have been updated based on the borrower's income documentation.
> Inputs that may be updated based on the borrower's documentation are limited to the following:
>> a. Association Dues/Fees before Modification
>> b. Monthly Hazard and Flood Insurance
>> c. Monthly Real Estate Taxes
>> d. Monthly Gross Income
>> e. Unpaid Principal Balance After Modification (interest-bearing UPB)
>> f. Principal Forbearance Amount
>> g. Interest Rate After Modification
>> h. Amortization Term After Modification
>> i. Principal and Interest Payment After Modification
>>
>> Inputs that may not change regardless of their evolution since the trial's initiation include:
>> a. Unpaid Principal Balance Before Modification
>> b. Borrower Credit Score and Co-borrower Credit Score
>> c. Property Value
>> d. Interest Rate Before Modification
>> e. Term Before Modification
>> f. Monthly Principal and Interest Payments Before Modification
>> g. Months Past Due
>> h. ARM Reset Rate and ARM Reset Date
>> i. Data Collection Date
>> j. Imminent Default Status
>> k. NPV Run Date
>> l. Advances/Escrow
>> m. Discount Rate Risk Premium (spread of discount rate over PMMS rate)

- Servicers who have implemented a proprietary NPV model or are operating a recoded version of the base NPV model must ensure that all economic inputs remain constant from the first to subsequent tests. Inputs that should be held constant include the PMMS rate and all quarterly input tables.

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 recoded HAMP NPV model as a prerequisite to certifying such models for use in evaluating loans for HAMP; and regularly thereafter (as long as the servicer continues to use the recoded model). The objective of the NPV Output test is to ensure that a servicer's recoded 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 they receive a formal certification letter from MHA-C, they are free to begin utilizing their recoded HAMP NPV model in production.
2. **NPV Onsite Review** – MHA-C performs onsite reviews for each servicer with an approved implementation of the HAMP NPV model that has been recoded into their own systems, 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. **Monitor reasonableness of data inputs to the NPV Model** – MHA-C reviews loan submissions to ensure reasonableness of model use against 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 recode model. Servicers must successfully pass output tests administered by MHA-C.
3. Assure that the recoded NPV model is capable of capturing and storing results of the NPV and Principal Reduction Alternative (PRA) NPV runs.
4. Assure that the recoded NPV model is 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. Assure 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 recoded 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 assure that the servicer's recoded 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 utilize the Treasury NPV portal within 30 days of any de-certification of the recoded NPV model by MHA-C.
10. Acknowledge terms of use for its recoded base NPV model, which is subject to ongoing testing by MHA-C for the life of HAMP, and participate in any orientation or training required by MHA-C.

Post certification NPV Compliance Requirement: Servicer Self-Testing and Quality Assurance

Every calendar quarter, 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 are expected to conduct quarterly self-testing utilizing this self-test deck, to ensure that their recoded model continues to provide NPV outputs consistent with the Treasury Portal NPV.

Servicers are also required to implement an independent quality assurance (QA) program for their recoded 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, on a monthly basis:
- Use of a statistically valid sample of loans out of the population submitted through the servicer's recoded 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/system.

Please direct all questions related to MHA Compliance certification to Dane D'Alessandro at dane_d'alessandro@mhacompliance.com.

VII. Calculation Logic for the HAMP Waterfall

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

Eligibility

Eligible loans must be originated on or before January 1, 2009. New borrowers will be accepted until December 31, 2012. Program payments will be made for up to five years after the date of entry. The mortgage loan must be secured by a one- to four-unit property, one unit of which is the borrower's principal residence. Cooperative-share mortgages and mortgage loans secured by one-unit condominiums and manufactured homes[26] are eligible for the HAMP. Investor properties, second homes, vacant, and condemned properties are not allowed. There is no minimum or maximum current LTV ratio for eligibility purposes.

Current UPB limits (pre-modification and pre-capitalization) are as follows:
- o 1 Unit $729,750
- o 2 Units $934,200
- o 3 Units $1,129,250
- o 4 Units $1,403,400

The servicer must apply the standard waterfall (depicted in Figure 2) to all loans that meet the basic eligibility requirements. This waterfall adjusts the borrower's current loan terms in order to achieve a target front-end DTI of 31%. The waterfall step that results in a front-end DTI closest to 31% (without going below 31%) will satisfy the front-end DTI target. There is no restriction on reducing front-end DTI below 31%, but any portion of the reduction below 31% will not be compensated by the government. Government compensation will be based on verified borrower income.

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) or interest-only mortgage (IO) and the interest rate is expected to reset or recast 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 GSE loans, use the current monthly payment.

Step 2: Capitalize Arrearage

If the loan has any arrearage, the arrearage is capitalized to determine the new UPB. Items that may be capitalized include accrued interest, past-due real estate taxes, insurance premiums, delinquency charges paid to third parties and not retained by the servicer or its affiliate, and any required escrow advances. Late fees are not capitalized.

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[26] For complete guidance on eligible property types, refer to Chapter II, Section 1.1 of the MHA Handbook.

Step 3: Principal Forgiveness
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: Rate Reduction
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 new rate cannot be lower than 2%. If the target DTI is met and the resulting interest rate is higher than the interest rate cap[27], 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: Term Extension
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 DTI cannot be reached with the maximum term extension, then principal forbearance is considered.

Step 6: Principal Forbearance
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:
  o maturity of the modified loan,
  o a sale of the property, or

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[27] 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.

o   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.

Figure 2

Standard HAMP Logic Flow

1. Calculate current DTI for mod candidate DTI >31% Determine delinquent or Imminent default

→ **2. Capitalize arrearage (accrued interest, past due insurance, taxes, no late fee)**

→ **3. Principal Forgiveness**

→ **Obtain 31% DTI (include tax & insurance)?**
- Yes → **No Mod (servicer discretion)**
- No → **Determine new payment at 31% of current income**

Note:
DTI = front end ratio

For ARM loans, DTI is the max of current DTI (i.e. current payment) or DTI after ARM reset (i.e. new payment if reset occurs within 120 days)

4. Rate Reduction in increments of 0.125 until 31% (but not under) or 2% floor

→ **Obtain 31% DTI (include tax & insurance)?**
- Yes → **Is new rate below market rate (FRE)?**
  - No → **New rate stays for the life of modified loan**
  - Yes → **After 5 years - Increase rate 1% per year until reach FRE rate**
- No → **5. Term Extension (40 year max – re-amortize from time of mod)**

→ **Obtain 31% DTI (include tax & insurance)?**
- Yes →
- No → **6. Principal Forbearance**
  − No interest 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:
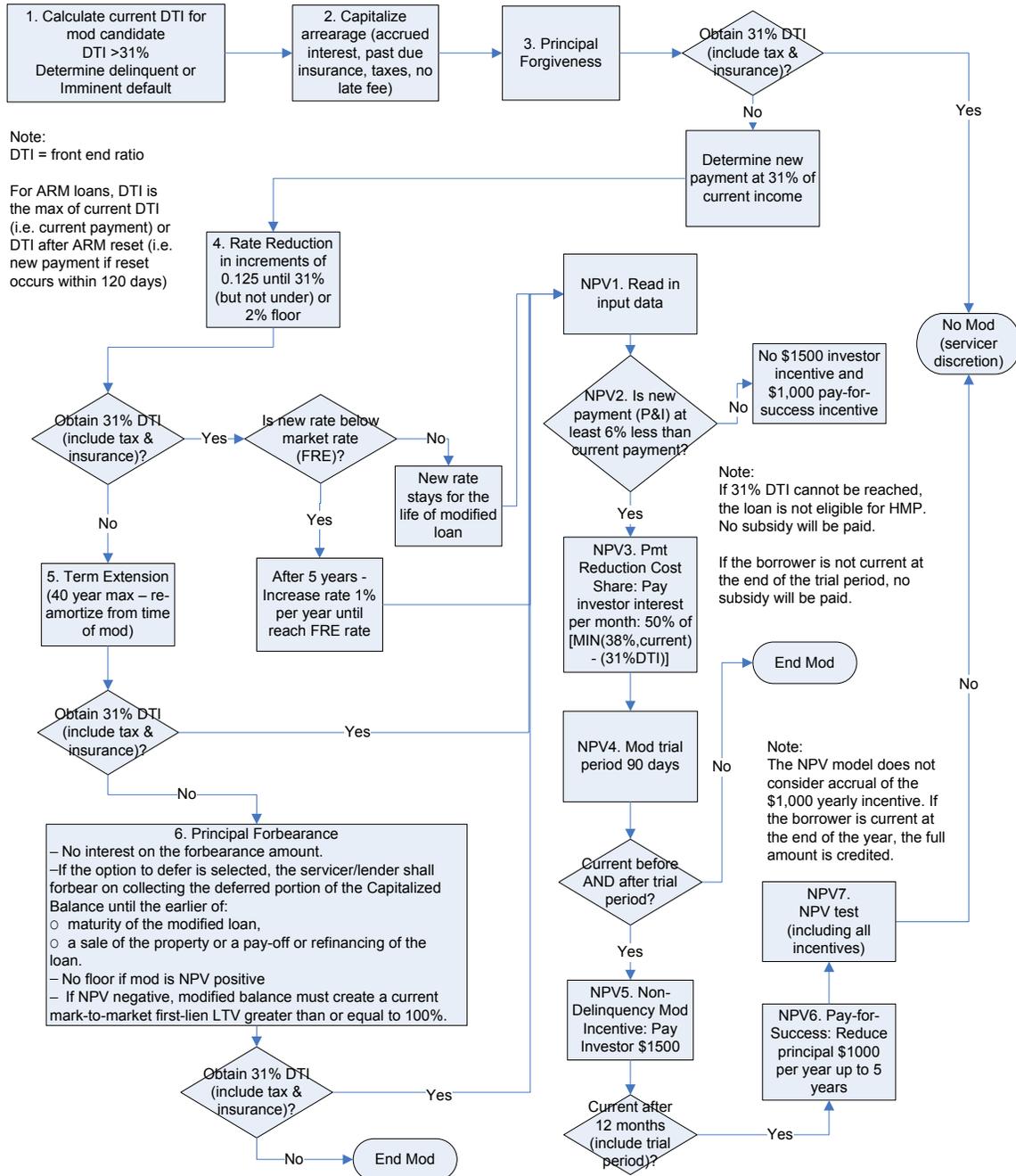 ○ maturity of the modified loan,
  ○ a sale of the property or a pay-off or refinancing of the loan.
  − No floor if mod is NPV positive
  − If NPV negative, modified balance must create a current mark-to-market first-lien LTV greater than or equal to 100%.

→ **Obtain 31% DTI (include tax & insurance)?**
- Yes →
- No → **End Mod**

NPV1. Read in input data

→ **NPV2. Is new payment (P&I) at least 6% less than current payment?**
- No → **No $1500 investor incentive and $1,000 pay-for-success incentive**
- Yes → **NPV3. Pmt Reduction Cost Share: Pay investor interest per month: 50% of [MIN(38%,current) - (31%DTI)]**

→ **NPV4. Mod trial period 90 days**

→ **Current before AND after trial period?**
- No → **End Mod**
- Yes → **NPV5. Non-Delinquency Mod Incentive: Pay Investor $1500**

→ **Current after 12 months (include trial period)?**
- Yes → **NPV6. Pay-for-Success: Reduce principal $1000 per year up to 5 years** → **NPV7. NPV test (including all incentives)**

Note:
If 31% DTI cannot be reached, the loan is not eligible for HMP. No subsidy will be paid.

If the borrower is not current at the end of the trial period, no subsidy will be paid.

Note:
The NPV model does not consider accrual of the $1,000 yearly incentive. If the borrower is current at the end of the year, the full amount is credited.

Default Model Parameters:

Category	Coefficient				LTV Spline
	Current	**D30**	**D60**	**D90+**	
Intercept	-2.95	-2.25	-1.98	-1.15	N/A
MTMLTV	0.0494	0.0425	0.0375	0.0255	N/A
MTMLTV Spline (knot = 80)	0	0	0	0	max((MTMLTV *100 - 80),0)
MTMLTV Spline (knot = 100)	0	0	-0.01084	0	max((MTMLTV *100 - 100),0)
MTMLTV Spline (knot = 120)	0	0	-0.01448	-0.01309	max((MTMLTV *100 - 120),0)
Credit Score	-0.00568	-0.00495	-0.00332	-0.00195	N/A
DTI_START	0.010	0.015	0.025	0.045	N/A
LN (DTI_START - (DTI_MODIFIED-1))	-0.275	-0.365	-0.555	-0.745	N/A

Prepayment Model Parameters:

Category	Coefficient				Spline
	Current	**D30**	**D60**	**D90+**	
Intercept	-6.77290	-4.79850	-4.45460	-1.37050	1
12 Month HPI growth I	23.33620	8.15460	13.89710	18.94080	min(-0.08, hpag)
12 Month HPI growth II	-11.32990	6.66340	4.51430	-2.02320	max(-0.08, min(-0.05, hpag))-(-0.08)
12 Month HPI growth III	12.49740	20.22000	23.77220	23.98950	max(-0.04, min(-0.00, hpag))-(-0.04)
12 Month HPI growth IV	10.71230	5.06520	1.06880	-3.18550	max(-0.00, min(0.05, hpag))-(-0.00)
12 Month HPI growth V	4.34290	7.02440	9.31150	10.82550	max(0.05, min(0.10, hpag))-(0.05)
12 Month HPI growth VI	-12.44470	-7.73590	-4.31290	-3.98380	max(0.10, hpag)-0.10
INCT I	0.57560	1.39320	0.55020	1.41200	min(-1.5, inct)
INCT II	0.01380	0.20490	0.48820	0.15700	max(-1.5, min(-1, inct))-(-1.5)
INCT III	0.81380	0.34720	0.02950	0.02000	max(-1, min(0, inct))-(-1)
INCT IV	1.61470	0.47370	0.01570	0.01870	max(0, min(0.5, inct))-0
INCT V	1.11900	0.34910	-0.00916	0.01410	max(0.5, min(1, inct))-0.5
INCT VI	0.18150	0.01280	0.07280	0.00800	max(1.0, min(1.5, inct))-1.0
INCT VII	-0.05330	0.04680	0.11730	0.00000	max(1.5, min(2, inct))-1.5
INCT VIII	-0.15510	-0.06170	-0.04060	0.00000	max(2.0, min(2.5, inct))-2.0
INCT IX	-0.10370	-0.01330	0.06170	0.00000	max(2.5, inct)-2.5
MTMLTV I	0.00300	-0.00186	-0.00849	-0.01790	min(50,mltv)
MTMLTV II	-0.00765	-0.01870	-0.02620	-0.03710	max(50,min(70, mltv)) - 50
MTMLTV III	-0.02960	-0.01950	-0.02820	-0.04450	max(70,min(80, mltv)) - 70
MTMLTV IV	-0.00812	-0.02140	-0.03670	-0.06390	max(80,min(90, mltv)) - 80
MTMLTV V	-0.08470	-0.10940	-0.07190	-0.08210	max(90,min(100, mltv)) - 90
MTMLTV VI	-0.07160	-0.09980	-0.11430	-0.09160	max(100,min(110, mltv)) - 100
MTMLTV VII	-0.04340	-0.04320	-0.03530	-0.02940	max(110, mltv) - 110
Credit Score I	0.00340	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	0.01580	0.01320	0.01300	0.01150	min(80, amt)
Original Amount II	0.00683	0.00603	0.00430	0.00560	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