



HOME AFFORDABLE MODIFICATION PROGRAM

BASE NET PRESENT VALUE (NPV) MODEL v1.0
MODEL DOCUMENTATION

April 15, 2009

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I. Overview

A central element of the Home Affordable Modification Program (HMP) is the use of a net present value (NPV) model. An NPV model will be used by servicers participating in the HMP 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, and is therefore illustrative of an NPV model servicers will use when participating in the program. While servicers are not precluded from using this base NPV model, it is anticipated that servicers will use the base NPV model to develop and, to some extent, customize their own NPV model based on their individual portfolio experience.

The documentation of the base NPV model methodology, provided herein, should provide servicers standardized guidelines as they develop NPV models for use in the program

The base NPV model assesses borrower and loan information for HMP 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 expected 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 and proprietary servicer NPV models are designed to guide this assessment for all servicers participating in HMP.

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 HMP program guidelines is NPV positive, the servicer participating in this program is required to perform an HMP 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. Considerations for Cash Flows in the Base NPV Model

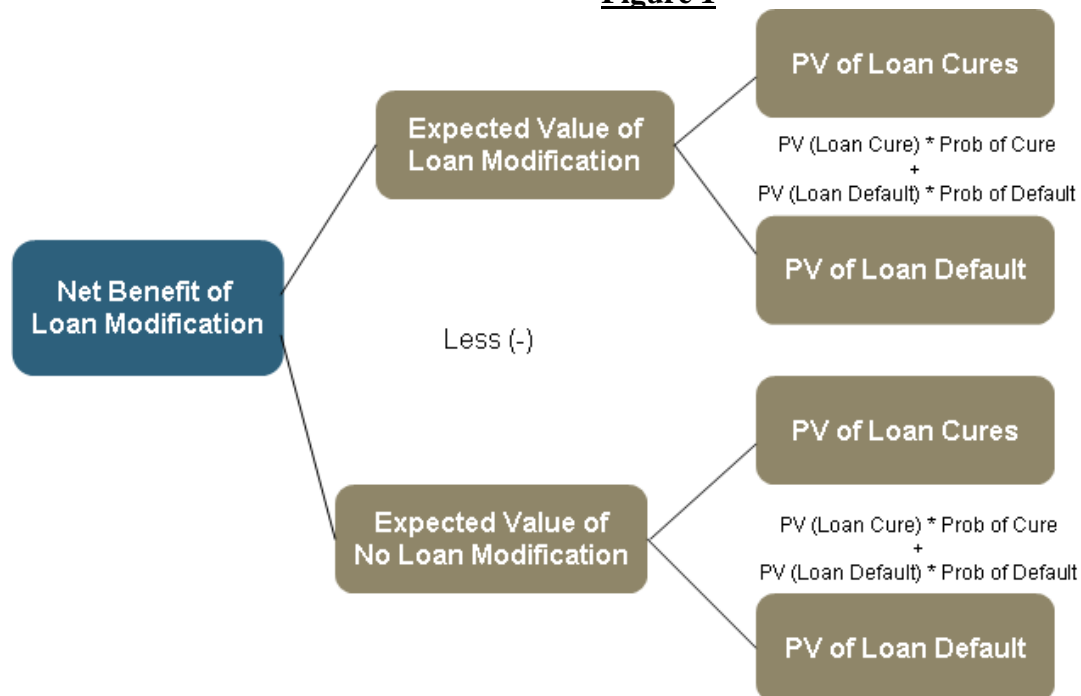
This section briefly summarizes the cash flows considered in the base NPV model calculation. In addition to the cash flows from the principal and interest of the loan, government incentives are provided to the investors under the HMP program. The timing and amount of these incentives are specified below.

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, largely 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 test 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



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 the HMP (including the trial period), the U.S. Treasury, acting through Fannie Mae as its financial 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 mod is higher than 31%, the loan is not eligible for HMP 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.

$$\text{Making Home Affordable Incentive} = 50\% [\text{MIN}(38\% \text{ or current DTI}) - 31\% \text{ DTI}]$$

Subsidy payments accumulate during the three-month trial period but are only paid if and when the trial period is successfully completed and the modification agreements are signed.

\$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 Making Home Affordable 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 HMP. 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 years, provided the borrower remains eligible. The payment will be calculated as the lesser of (i)

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 income. Mortgage insurance is excluded from the PITIA calculation.

\$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.

Investor Home Price Depreciation Payments

These are not considered in version 1.0 of the base NPV model, but will be included in subsequent versions.

De Minimis Requirement

To qualify for the \$1,500 Non-delinquency Modification Incentive payment to investors or the \$1,000 borrower Pay-for-Performance Success Payments, 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 either the Payment Reduction Cost Share or the Home Price Depreciation Payment.)

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 will 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 HMP 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.

III. Base NPV Model Components

Overall Process

The servicer makes contact with the borrower and determines whether he/she qualifies for the HMP. The servicer obtains borrower information such as current gross income and mortgage-related and non-mortgage-related debt. If the borrower meets basic eligibility criteria, the servicer runs the loan through the HMP waterfall and determines the modification terms. The NPV test is performed to determine whether the modification has 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 HMP. 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 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 table below).
- c) The terms of the proposed Home Affordable Modification (columns AK-AP from the table below).

Base NPV Model Inputs

Column	Label	Field Type	Field Validation
A	Investor	Character(3)	Allowable values: FNM, FRE, GNM, OTH
B	Servicer Loan Number	Character(30)	Max 30 characters
C	GSE Loan Number	Character(30)	Max 30 characters
D	HMP Servicer Number	Character(30)	Max 30 characters
E	Data Collection Date	Date	YYYY-MM-DD
F	Property - Number of Units	Character(1)	Allowable values: 1,2,3,4
G	First Payment Date at Origination	Date	YYYY-MM-DD
H	Unpaid Principal Balance at Origination	Number	
I	Amortization Term at Origination	Integer	
J	Interest Rate at Origination	Rate(5)	0.xxxxx
K	LTV at Origination (1 st Lien only)	Rate(5)	0.xxxxx
L	Current Product Type	Character(3)	Allowable values: ARM, FRM, IO
M	Next ARM Reset Rate	Rate(5)	0.xxxxx
N	ARM Reset Date	Date	YYYY-MM-DD
O	Remaining Term (# Payment Months Remaining)	Integer	
P	Unpaid Principal Balance Before Modification	Number	
Q	Interest Rate Before Modification	Rate(5)	0.xxxxx
R	Principal and Interest Payment Before Modification ²	Number	

² In this version, for interest-only and ARM loans that do not reset within four months, the base NPV model computes the fully amortizing principal and interest payment at the current interest rate and uses that payment in the calculation of DTI. When such loans do reset within four months, the base NPV model computes the fully

S	Current Borrower FICO	Integer	3 digits
T	Current Co-borrower FICO	Integer	3 digits
U	Property - Zip Code	Character	5 digits
V	Property – State	Character	2 digits
W	Monthly Association Dues/Fees	Number	
X	Monthly Hazard and Flood Insurance	Number	
Y	Monthly Real Estate Taxes	Number	
Z	MI Coverage Percent³	Rate(5)	0.xxxxx
AA	Current Property Value	Number	
AB	Mark-to-Market LTV	Rate(5)	x.xxxxx
AC	Months Past Due	Integer	
AD	Advances/Escrow	Number	
AE	Borrower’s Total Monthly Obligations	Number	
AF	Monthly Gross Income	Number	
AG	Imminent Default Flag	Character (Boolean)	Y/N
AH	Discount Rate Risk Premium	Rate(5)	Maximum: 0.02500
AI	Modification Fees	Number	
AJ	MI Partial Claim Amount	Number	
AK	Unpaid Principal Balance After Modification (Net of Forbearance & Principal Reduction)	Number	
AL	Interest Rate After Modification	Rate(5)	0.xxxxx
AM	Amortization Term After Modification	Integer	
AN	Principal and Interest Payment After Modification	Number	
AO	Principal Forbearance Amount	Number	
AP	Principal Forgiveness Amount	Number	

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

- **Discount Rate Risk Premium** – Default value is the weekly Freddie Mac Primary Mortgage Market Survey (PMMS) 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 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

- **Current Market Rate** – Freddie Mac’s PMMS rate for 30-year fixed-rate conforming loans.
- **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:

amortizing principal and interest payment based on the rate to which the loan would reset – assuming reset at the time of the base NPV model calculation.

³ The servicer may choose to exclude MI coverage with investor consent.

- Credit quality of the borrower(s);
- Marked-to-market loan-to-value ratio (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.
- **Constant Prepayment Rate (CPR)**
 - Pre-mod loans that are in imminent default – 10% CPR per annum;
 - Pre-mod loans that are delinquent 60 days or more – 5% CPR per annum;
 - Post-mod loans (first five years) – 2% CPR per annum;
 - Post-mod loans (after five years) – 10% CPR per annum.
- **ARM/IO Reset or Recast** – ARMs and IO loans with a payment scheduled to reset or recast in the next four months 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 four months, amortize the loan using the current interest rate, current unpaid principal balance (UPB), and the remaining term. The resulting principal and interest payment is considered in the cash flows of the unmodified loan. In this instance, the “Principal and Interest Payment before Modification” input field is used to calculate the front-end DTI.
 - If the ARM/IO loan *will* reset or recast in next four months, amortize the loan using the reset interest rate, current UPB, and the remaining term. The resulting principal and interest payment is considered in the cash flows of the unmodified loan. Front-end DTI is calculated using the greater of the “Principal and Interest Payment before Modification” input field and the current scheduled payment (the pre-reset payment).
- **REO Stigma** – REO stigma represents the difference between the sale price of a foreclosed property and the sale price of comparable properties that are not foreclosures. The measure is expressed as a percentage of the non-foreclosure sales price. A GSE Automated Valuation Model (AVM) was used to determine the estimated non-foreclosure sale price. The stigma discount is based upon combined data on Fannie Mae and Freddie Mac sale prices of foreclosed single-family properties. This stigma reflects the deterioration in value that often occurs as a home goes through the foreclosure sale process. This stigma varies by property location and value. The state-level median stigma discounts are provided separately for properties that are above and below \$100,000 in value. (The REO Stigma table will be updated regularly in the “Base NPV Model Documentation Supplement” posted on the Home Affordable Modification Program servicer Web site portal, www.HMPadmin.com, accessed from www.financialstability.gov.)
- **Home Price Projection** – A single two-year national home price projection is used for all home-price related calculations. The same projection is applied to all loans considered for modification regardless of the location of the property. The projection is developed using

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. The data is different from that comprising the FHFA House Price Index, which does not include 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. The forecasting model considers projected income, population growth, and short-term macroeconomic drivers like housing starts. (The National Home Price Forecast table will be updated regularly in the “Base NPV Model Documentation Supplement” posted on the Home Affordable Modification Program servicer Web site portal, www.HMPAdmin.com.)

▪ **Foreclosure, REO, and Disposition Timing and Costs**

- Foreclosure timeline data is calculated on all defaults (including pre-foreclosure sales, third-party sales, REO, and all other cases) that had their liquidation date in 2008. 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 2008. 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 Timeline data will be updated regularly in the “Base NPV Model Documentation Supplement” posted on the Home Affordable Modification Program servicer Web site portal, www.HMPAdmin.com.)
- Foreclosure & REO costs are calculated based on 2008 GSE REO cases on a weighted-average basis for each state. Settlement costs are calculated based on 2008 GSE REO direct-sale cases only on a weighted-average basis for each state. (Foreclosure & REO Cost data will be updated regularly in the “Base NPV Model Documentation Supplement” posted on the Home Affordable Modification Program servicer Web site portal, www.HMPAdmin.com.) Costs are calculated excluding all taxes, large repairs (greater than \$3,000) that would significantly change a property’s value, homeowners’ insurance premiums, homeowners’ association fees, and condominium fees. (These expenses are dealt with separately in the base NPV model framework).

1. Foreclosure & REO costs are the sum of:

- a) Attorney and Trustee Fees
- b) Possessory and Eviction Fees and Expenses
- c) Bankruptcy Expenses
- d) Servicer Liquidation Expenses
- e) MI Premium
- f) Flood Insurance Premium
- g) Title Insurance
- h) Appraisal Fees
- i) Property Inspection
- j) Utilities

- k) Property Maintenance/Preservation
- l) Other Foreclosure and Holding Costs
- m) Total Repairs (capped at \$3,000 to exclude discretionary repairs)
- n) Participation expenses
- o) Foreclosure costs that are paid out at property sale (from HUD-1)

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

2. Settlement costs 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 is paid out at property sale. That value is included in the calculation of the Foreclosure & REO costs rather than Disposition costs. 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 HMP. 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 an NPV model. The result of the Waterfall Check does not attest to whether the terms of the modification

follow the HMP 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 HMP guidelines.

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

- Post-mod interest rate must be within 12.5 basis points of the interest rate calculated by the base NPV model. Minimum rate is 2%.
 - Post-mod amortization term must be within 12 months of the term calculated by the base NPV model. Maximum term is 480 months
 - Forbearance amount must be within \$1,000 of the amount calculated by the base NPV model.
- **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)** – Cases where the loan after modification is NPV negative and the amount forborne makes the interest-bearing UPB less than the market value of the property.

2. NPV Results

- **HMP 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)
- **Eligibility** – Whether the loan is eligible for the NPV test. Ineligible loans are those with issues that prevent an NPV model from running. Ineligible loans will not have NPV values listed. Eligibility messages include:
 - Eligible
 - Ineligible – Data Issues
 - Ineligible – Excessive forbearance
In cases where the NPV is negative and the Forbearance Flag is “Y”, an NPV model will show the loan as “Ineligible.”
 - Ineligible – Under 31% DTI
In cases where the front-end DTI before modification is already under 31%, an NPV model will show the loan as “Ineligible.”
- **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

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, or the \$1,000 per year borrower Pay-for-Performance Success Payment. However, the investor is entitled to the Payment Reduction Cost Share and Home Price Depreciation Payment.
3. If the NPV for the mod is negative and the investor does not want to continue with the HMP program, the loan is not eligible for program subsidy.
4. If the NPV of the mod 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.

IV. Base NPV Model Equations

Below we describe the base NPV model 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:

$$NPV = (1 - p).NPV \{LoanCures\} + p.NPV \{LoanDefault\}$$

where p is the lifetime default probability⁴.

Discounted Future Cash Flows – Four Cases

1. No Mod: NPV{Loan Cures}

For each month i , 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 must also be accounted for. Here we make the simplifying assumption that the P&I arrearage is paid immediately and we approximate the arrearage as:

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

Hence,

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

where:

MDLQ – Months delinquent

T – Remaining Term

δ – Monthly discount rate

UPB – Unpaid Principal Balance

P – Principal

I – Interest

CPR – Constant Prepayment Rate

SMM – Single Month Mortality, calculated as $SMM = 1 - (1 - CPR)^{1/12}$

⁴ Default equations are defined at the end of this section.

2. No Mod: NPV{Loan Defaults}

The base NPV model utilizes a simplified approach to the timing of default. For the non-modification scenario, the base NPV model assumes that if the loan defaults it makes no further payments and proceeds to default according to state-level foreclosure (FCL) timelines.

$$\begin{aligned} \text{Months to FCL} &= \text{Max}(1, \text{Average State Level FCL timeframe} - \text{MDLQ}) \\ S \equiv \text{Months to REO Sales} &= \text{Months to FCL} + \text{Average State Level REO timeframe} \end{aligned}$$

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/Disposition Costs** – State-level average costs are used. Note that these are based on UPB.

b. **Settlement Charges** – Including broker fees are state-level charges as a percentage of the gross REO sales proceeds.

c. **MI Proceeds**⁵

$$= \text{Min}((\text{MI CoveragePct} * \text{UPB} * 1.15), \text{Max}(\text{UPB} * 1.15 - \text{Net REO Sales Proceeds}, 0))$$

d. **Net REO Sales Proceeds** – The sales price of the REO property is calculated by marking forward a current property value⁶ to the projected REO Sales date using a national level home price forecast. In addition, a state-level REO stigma discount is applied to reflect REO sales.⁷ Thus:

$$\text{Net REO Sales Proceeds} = \text{MTMVal} * (1 - \text{Stigma}) * \text{HPForecast} * (1 - \text{Settlement Charges})$$

In summary:

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

⁵ The servicer may choose to exclude MI coverage with investor consent. The 15% gross-up of UPB approximates accrued interest and foreclosure/disposition costs.

⁶ The current property value is provided by the servicer and may be obtained through an approved Automated Valuation Model such as Freddie Mac's Home Value Estimator (HVE) or Fannie Mae's Automated Property Service (APS), or a broker price opinion.

⁷ Each component is described in detail in the next section.

3. Mod: NPV{Loan Cures}

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

$$\begin{aligned}
 PV\{LoanCures\} = & \sum_{i=1}^T \frac{1}{(1+\delta)^i} \{ [UPB_{i-1} - P_i + F] [(1-SMM)^{(i-1)} - (1-SMM)^i] + [P_i + [I_i + GS_i]] (1-SMM)^{(i-1)} \} \\
 & + \left[\frac{II_1 + (3 * GS_4)}{(1+\delta)^4} \right] (1-SMM)^3 + \sum_{j=1}^5 (1-SMM)^{(12*j)-1} \frac{M}{(1+\delta)^{(12*j)}} \\
 & - Mfee + MIPartialClaim + \left[\frac{F}{(1+\delta)^T} \right] (1-SMM)^T
 \end{aligned}$$

Where:

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

M = Borrower incentive paid for five years at the end of each year if the loan is current 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

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

$$\text{Otherwise } GS_i = 0$$

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.

II_1 – Investor Initiation Incentive = \$1,500 if modified loan was current at the beginning of, and throughout, the trial period and the payment is decreased by $\geq 6\%$

F – Forbearance amount that is ballooned without interest

$Mfee$ – 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 base NPV model is used to evaluate an MI company partial claim offer subsequent to a negative NPV result and MI insurer review,

4. Mod: NPV{Loan Defaults}

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

S ≡ Months from LPI until REO Sale

$$\begin{aligned}
 PV\{Default\} = & \left[\sum_{i=1}^6 \frac{1}{(1+\delta)^i} \left\{ [UPB_{i-1} - P_i + F][(1-SMM)^{(i-1)} - (1-SMM)^i] + [P_i + [I_i + GS_i]](1-SMM)^{(i-1)} \right\} \right] \\
 & + \left[\frac{II_1 + (3 * GS_4)}{(1+\delta)^4} \right] (1-SMM)^3 + \left[\sum_{j=7}^{S+6} \left[\frac{-C}{(1+\delta)^j} \right] + \frac{NPDV - MIPartialClaim}{(1+\delta)^{S+6}} \right] (1-SMM)^6 \\
 & - Mfee + MIPartialClaim
 \end{aligned}$$

Here the first term reflects the six months of cash flows resulting from the timely payments of P&I during the trial period. The second term defines the incentive payment made after the end of the trial period. The third term defines the cash flows from the default that is set into motion in month seven and concludes with REO Sale in month S+6.

Base NPV Model for Determining Probability of Default

The base NPV model contains a simple and intuitive base model for determining the probability of default – both without modification and with modification. The base model was estimated using historical data and, given the lack of 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 base 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 LTV levels, lower FICO scores, and higher original DTI levels. 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 equations for the base model are shown below. These equations are based upon logistic regressions with separate equations by loan status (current, D30, D60, D90+). To calculate the probabilities the anti-logit transformation must be applied. That is, for each Z listed below:

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

Current Loan Equation

$$Z = -2.95 + 0.0494 * LTV - 0.00568 * FICO + 0.01 * DTI_START - 0.275 * \ln(DTI_START - (DTI_MODIFIED - 1)) * REDEF_IND$$

30 Days DLQ Equation

$$Z = -2.25 + 0.0425 * LTV - 0.00495 * FICO + 0.015 * DTI_START - 0.365 * \ln(DTI_START - (DTI_MODIFIED - 1)) * REDEF_IND$$

60 Days DLQ Equation

$$Z = -1.98 + 0.0375 * LTV - 0.00332 * FICO + 0.025 * DTI_START - 0.555 * \ln(DTI_START - (DTI_MODIFIED - 1)) * REDEF_IND$$

90+ Days DLQ Equation

$$Z = -1.15 + 0.0255 * LTV - 0.00195 * FICO + 0.045 * DTI_START - 0.745 * \ln(DTI_START - (DTI_MODIFIED - 1)) * REDEF_IND$$

where:

LTV – Marked to market LTV (of the first lien but not junior liens)

FICO – Current FICO score or equivalent (minimum of borrower and co-borrower)

DTI_START – Front-end ratio before the modification, must be 31 or above

DTI_MODIFIED – Front-end ratio after the modification

REDEF_IND – Binary indicator set to 1 for calculating the re-default probability and set to 0 for default probability

The base model coefficients were set to be consistent with observed default rates on a broad loan population using data selected from Freddie Mac seasoned loans along with ABS/MBS data from First American CoreLogic. Coefficients will be updated as performance data from the modification program becomes available.

V. Requirements for Customization of the Base NPV Model by Servicers

Servicers with at least a \$40 billion servicing book, or who otherwise receive permission to do so, may choose to build and implement proprietary NPV models for use in the HMP. As described in Section I, *Overview*, the base NPV model is illustrative for this purpose. Servicer-developed 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’s PMMS 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.
- Constant Prepayment Rate
 - Pre-mod loans that are in imminent default – 10% CPR per annum
 - Pre-mod loans and 60+ days delinquent – 5% CPR per annum
 - Post-mod loans (first five years) – 2% CPR per annum
 - Post-mod loans (after five years) – 10% CPR per annum
- REO Stigma – GSE matrix (The REO Stigma table will be updated regularly in the “Base NPV Model Documentation Supplement” posted on the Home Affordable Modification Program servicer Web site portal, www.HMPAdmin.com.)
- Home Price Projection (The National Home Price Forecast table will be updated regularly in the “Base NPV Model Documentation Supplement” posted on the Home Affordable Modification Program servicer Web site portal, www.HMPAdmin.com.)
- Foreclosure & REO Disposition Times (REO & Foreclosure Timeline data will be updated regularly in the “Base NPV Model Documentation Supplement” posted on the Home Affordable Modification Program servicer Web site portal, www.HMPAdmin.com.)
- Foreclosure & REO Expenses and Selling Costs (Foreclosure & REO Cost data will be updated regularly in the “Base NPV Model Documentation Supplement” posted on the Home Affordable Modification Program servicer Web site portal, www.HMPAdmin.com.)
- 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.

Foreclosure timelines and costs, REO stigma, 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 constant prepayment rate is applied in the base NPV model calculations detailed in the *Base Model Equations* section.

Servicer-Specific NPV Model Inputs

Servicers with proprietary NPV models are allowed to use their own internal models to determine default rates in the no-modification and modification scenarios. For purposes of the NPV calculation, default is defined as an event that ends in foreclosure and property disposition, with no possibility of cure, because the test assumes some rate of cure for loans in any stage of delinquency. The default model a servicer uses to establish these rates should take into account the variables determining the probability of default included in the default model used in the NPV model – current LTV, current DTI, current credit score, delinquency status, as feasible, and any other relevant variables the servicer identifies. Servicer judgment regarding the effect of DTI is expected, given the limited data available and the likelihood that the new program will materially reduce the modification re-default rate. However, all assumptions must be tested as program data become available and revised as appropriate.

The no-modification and modification default equations must be uniform across all loans. These equations may not distinguish between loans in portfolio and investor pools. In the modification default scenario, the model must assume the loan performs for six months, then becomes delinquent and defaults.

Loans at risk of imminent default (those that meet the test of imminent default the servicer employs along with the verification requirements in the Home Affordable Modification Program Guidelines) are treated as having the same level of default risk as a loan 60 days or more past due.

VI. Calculation Logic for the HMP Waterfall

This section discusses the waterfall logic described in the HMP 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 homes⁸ are eligible for the HMP. 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:

- 1 Unit \$729,750
- 2 Units \$934,200
- 3 Units \$1,129,250
- 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 within four months, DTI is calculated using the reset 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.

Step 3: Principal Forgiveness

There is no requirement to use principal reduction under the program, and it is not a formal step in the HMP 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

⁸ For complete guidance on eligible property types, refer to Supplemental Directive 09-01.

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 cap⁹, 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 one-year increments to reach the target 31% DTI. The term begins at the start of the modification (after the trial period has been successfully completed). 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:

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

If the modification is NPV negative and the servicer chooses to modify the loan, the modified balance must create a current mark-to-market first-lien LTV greater than or equal to 100%. If the modification is NPV positive, there is no floor for forbearance. If the target DTI cannot be reached with principal forbearance, principal forgiveness can be considered.

⁹ See definition in Supplemental Directive 09-01. The "Interest Rate Cap" is the Freddie Mac Weekly Primary Mortgage Market Survey Rate (PMMS) for 30-year fixed-rate conforming loans, rounded to the nearest 0.125 percent, as of the date that the modification agreement is prepared.

Figure 2

HMP Logic Flow

