FHFA Technical Analysis of Principal Forgiveness

In January 2012, FHFA released the analyses the agency had conducted since December 2010 on the feasibility and benefit of principal forgiveness as a loan modification tool[1]. This paper presents the agency's most recent work, which considers subsidy payments[2] the Department of the Treasury would provide to Fannie Mae and Freddie Mac (the Enterprises) for reducing principal under the Home Affordable Modification Program (HAMP). The paper includes a number of sensitivity tests related to assumptions in the January 2012 analysis and methodological changes suggested by various industry, academic, and governmental organizations.

This paper is limited to an account of FHFA's model-based research. It does not include a discussion of, nor do the results presented reflect the complex challenges, significant costs, and substantial time required to implement the HAMP Principal Reduction Alternative (HAMP PRA) -- the HAMP modification that includes principal forgiveness. The Enterprises already participate in the original HAMP modification program, referred to as "standard HAMP."

After a brief introduction, the analyses are presented in three sections:

- Isolated Analysis of Principal Forbearance and Forgiveness
- Incorporation of the HAMP and HAMP PRA Waterfalls
- Optimal HAMP Modification

I. Introduction

Background

The January 2012 analysis used a model, discussed below, to compare the economics of principal forgiveness to principal forbearance. It laid the groundwork for further analysis, discussed in later sections, of more complex HAMP modifications, involving combinations of forbearance and/or forgiveness with other modification tools, such as rate reductions and term extensions. Subsequent analyses moved from conceptual comparisons of forgiveness and forbearance to increasingly refined scenarios looking at specific HAMP modifications and the borrowers who might receive them.

When FHFA prepared the January analysis, Treasury offered subsidy payments to private investors who engaged in principal forgiveness in connection with HAMP but not to the Enterprises. The January analysis assumed the Enterprises absorbed the full cost of principal forgiveness. Subsequently, Treasury announced that it would triple the subsidy payments offered to investors for forgiveness and make the same payments to the Enterprises as to private investors.

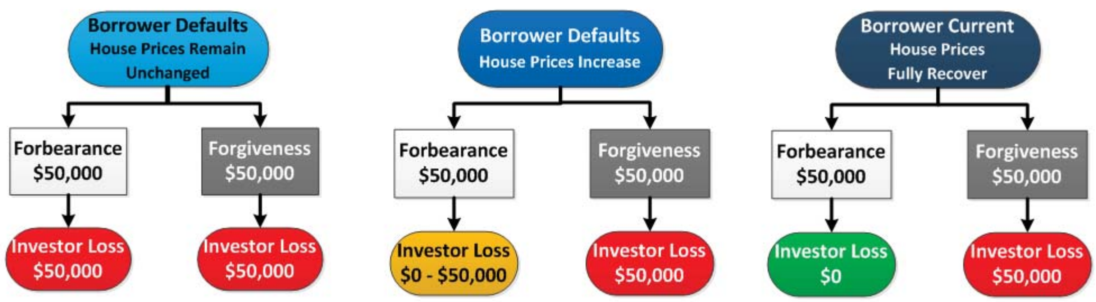
The new work presented in this paper explores the impact of various assumptions about the number and types of borrowers who would participate in standard HAMP or HAMP PRA and the resulting costs

[1] http://www.fhfa.gov/webfiles/23056/PrincipalForgivenessltr12312.pdf
[2] Treasury will use taxpayer funds appropriated to it under the Emergency Economic Stabilization Act of 2008 to make subsidy payments to the Enterprises.

or benefits to the Enterprises and American taxpayers. Preliminary results of this analysis were published in April 2012[3].

At the most basic level, the comparison between the loss mitigation strategies of principal forbearance and principal forgiveness relates to who gets the benefit in the event of future recovery of property value. For both principal forbearance and principal forgiveness, if a borrower defaults the Enterprises lose roughly the same amount. However, if a borrower performs successfully on the modification, in a principal forbearance modification the Enterprises retain the benefit of property appreciation up to the forborne amount. In a principal forgiveness modification, the borrower retains all of the benefit of any property appreciation[4] (see Figure 1).

Figure 1
Principal Forgiveness versus Principal Forbearance
Comparison of Investor Impact



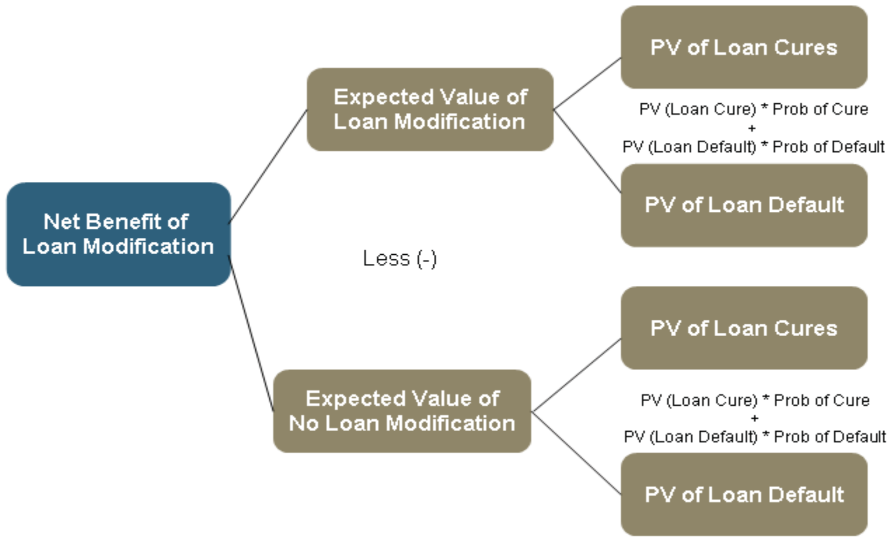
[3] FHFA Acting Director Edward J. DeMarco's remarks delivered at the Brookings Institution, http://www.fhfa.gov/webfiles/23876/Brookings_Institution_-_Principal_Forgiveness_v11R-_final.pdf

[4] Advocates of principal forgiveness often suggest coupling it with shared appreciation. In concept, shared appreciation involves the investor and the borrower splitting the benefit of potential increases in house value, with the investor recovering some or the entire forgiven principal. Forbearance provides a borrower with the full benefit of property appreciation over and above the pre-modification mortgage amount. Given minimal historical experience and the limitations of available models, FHFA can only speculate on the likely benefits or costs of shared appreciation, relative to either principal forbearance, or forgiveness without shared appreciation. Without solid evidence as to how borrower re-default rates would change under a shared appreciation program, there is no reliable way to evaluate whether such a program would be more cost effective than a program featuring principal forbearance.

HAMP Net Present Value Model

To compare economic costs and benefits for this analysis, FHFA used the Net Present Value (NPV) model developed by Treasury for HAMP. An NPV calculation estimates the value today of a future stream of cash flows, including both income and expenses. Under HAMP, loan servicers must use this model to determine whether a modification provides a favorable economic outcome for the investor, in which case a HAMP modification is required. This is the only model used across the industry for this purpose. Figure 2 illustrates the NPV model.

Figure 2
Treasury HAMP NPV Model



The Treasury NPV model compares for investors the economic value of a loan when it is modified and when it is not. That economic value is measured by calculating the discounted present value (PV) of the expected cash flows to the investor under those two options. The key factors affecting those expected cash flows are the mortgage terms and payments, and the likelihood of a borrower default or re-default in the future, along with the associated losses and costs. The model considers two sets of cash flows—cash flows with and without a borrower default or re-default—and applies weights to those alternatives based on their relative probabilities. More information on the Treasury's NPV model, including the assumptions used in the model, can be found at https://www.hmpadmin.com/portal/programs/docs/hamp_servicer/npvmodeldocumentationv50.pdf[5].

The NPV model contains simplifying assumptions. This may pose more model risk for seriously delinquent loans than for less delinquent or current loans. Delinquent loans receive larger amounts of forgiveness than otherwise identical current loans because delinquent interest, real estate taxes, insurance and homeowner association fees (arrearages) may be forgiven subject to program constraints. The larger the forgiveness amount, the larger the drop in mark-to-market loan-to-value ratio (MTMLTV[6]), a primary driver of re-default. While in practice, the amount forgiven occurs in thirds (in month 12, 24 and 36), there is no timing associated with the NPV default/re-default model. Therefore, the amount forgiven occurs in full at the time of loan modification, thereby causing the MTMLTV to drop

[5] This version of the model was released June 1, 2012. The analysis in this paper used the previous version.
[6] MTMLTV is also commonly referred to as current LTV.

in full and the probability of re-default to be understated, particularly for more seriously delinquent loans.

Presentation of Results

The results in Table 1 start with the base analysis released in January 2012, followed by a series of sensitivity tests around the assumptions in the base analysis. The analyses in tables 2 and 3 incorporate methodological changes from the base analysis made to improve or refine the overall research. Each analysis presented on a line in tables 1 through 3 builds on a prior analysis. A list of base assumptions is provided at the top of Table 1, and variations in assumptions for each subsequent analysis are listed next to that analysis. All of these analyses were performed by processing each Enterprise loan individually through the HAMP NPV model and then aggregating the resulting cash flows to determine the losses and savings outlined in the table. Results are presented in the order each analysis was completed, and an explanation of individual analyses is provided after each table of results.

In all the analyses, if a loan was NPV-positive (Enterprise losses were lower with a modification), the loan was assigned the losses associated with the modification. When a loan was NPV-negative (Enterprise losses were lower without a modification), the loan was assigned the losses associated with no modification. In calculating losses, the Treasury NPV model assumes private mortgage insurance claims are paid in full in the event of default or re-default.

For each line of the three tables, column A, "Expected Losses, No Modification," shows the expected losses[7] to the Enterprises if none of the loans in the analysis are modified. Columns B and C each show how much the modification listed in the column heading reduces those expected losses. Modification approaches in column C involve principal forgiveness; approaches in column B do not. Column D, "Enterprise Benefit," shows the difference between the values in column B and column C. A positive number means the approach in column C, with principal forgiveness, reduces losses more than the approach without forgiveness. A negative number means the approach without forgiveness, in Column B, produces a greater loss reduction. Column E shows the amount of Treasury subsidy payout that helps to generate any loss reduction shown in column C. The Treasury subsidies would be paid to the Enterprises with taxpayer funds, so column F shows the net benefit or cost to the taxpayer—the difference between columns D and E. A positive number in column F means the savings from the forgiveness approach, net of the Treasury subsidy, still produces a net benefit to the taxpayer; a negative number means there is a net cost to the taxpayer. As Table 1 shows, there is a net cost to the taxpayer for each analysis.

II. Isolated Analysis of Principal Forbearance and Forgiveness.

Table 1
Isolated Analysis of Principal Forbearance and Forgiveness

[7] Losses in column A (No Modification) represent the sum of the unpaid principal balances (UPB) of the loans less the sum of the NPV of their cash flows (without modifications). In order to arrive at the loss reductions shown in columns B and C, similar loss calculations first were performed assuming loan modifications specified in the column headings. Those losses were subtracted from the no modification losses to determine the reduction in losses.

Base Assumptions (presented in January 2012 analysis):

- Data as of 6/30/2011
- All loans above 115 percent MTMLTV
- All current and one-month delinquent loans are assumed eligible for HAMP
- FICO[a] at origination; DTI[b] at origination
- State-level HPI to project MTMLTV
- Forbearance/forgiveness sufficient to achieve 115percent MTMLTV

Forbearance-Only Modifications versus Forgiveness-Only Modifications ($ in billions; loan counts rounded to nearest thousand; totals may not add due to rounding)	**A** **Expected Losses, No Modifi-cation**	**B** **Reduction in Losses, Simple For-bearance**	**C** **Reduction in Losses, Simple For-giveness**	**D (C-B)** **Enterprise Benefit, Simple For-giveness versus Forbear-ance**	**E** **Treasury Subsidy**	**F (D-E)** **Net Taxpayer Benefit**
Base Assumptions: # of Loans: 1,406,000 Unpaid Principal Balance (UPB): $303.4 billion	$101.8	$24.3	$21.0	($3.3)	$0.0	($3.3)
Analysis 1 Assumptions: Base with ● Proposed Treasury incentive payments ● Forbearance/forgiveness sufficient to achieve MTMLTV to 105 percent # of Loans: 1,406,000 UPB: $303.4 billion	$101.8	$28.0	$34.7	$6.7	$13.2	($6.5)
Analysis 2 Assumptions: #1 with ● Lower FICO score # of Loans: 1,406,000 UPB: $303.4 billion	$102.8	$27.4	$34.3	$7.0	$13.1	($6.1)
Analysis 3 Assumptions: #1 with ● Higher DTI ratio # of Loans: 1,406,000 UPB: $303.4 billion	$103.9	$27.3	$34.1	$6.8	$12.9	($6.1)
Analysis 4 Assumptions: #1 with ● ZIP code-level MTMLTVs # of Loans: 2,615,000 UPB: $488.7 billion	$195.6	$52.2	$69.8	$17.6	$26.3	($8.8)
Analysis 5 Assumptions: #1 with ● Lower FICO score ● Higher DTI ratio ● ZIP code-level MTMLTVs # of Loans: 2,615,000 UPB: $488.7 billion	$198.7	$51.1	$68.7	$17.6	$25.8	($8.2)

[a]FICO score, a widely used consumer credit scoring system developed by the Fair Isaac Corporation
[b]Debt-to-income ratio

Base Analysis

The base analysis in the first line of Table 1 corresponds to the results from the January 2012 analysis for loans outstanding as of June 30, 2011.[8] In the base analysis and analyses 1 through 5, all current loans and those that have missed one payment were assumed to be eligible for a modification.

The purpose of the base analysis and the initial sensitivity analyses was to allow a simple comparison of principal forgiveness and principal forbearance, apart from changes to any other loan terms, such as interest rate or maturity term, or by the application of HAMP eligibility rules. Every loan that had an MTMLTV in excess of 115 percent, whether delinquent or current, was considered for a modification consisting only of forbearance or, alternatively, only of forgiveness, sufficient to achieve a 115 percent MTMLTV. To determine MTMLTV, FHFA projected changes in house values from loan origination to June 30, 2011, by applying FHFA's monthly state-level purchase-only House Price Indexes (HPI).

The base analysis shows that both types of modifications would reduce Enterprise credit losses—forbearance by $24.3 billion (column B), and forgiveness by $21.0 billion (column C). The total expected loss for forbearance is $77.5 billion (columns A minus B) and the total expected loss for forgiveness is $80.8 billion (columns A minus C). Under this analysis forbearance lowers Enterprise losses by $3.3 billion (column D) more than forgiveness.

In accordance with the NPV model assumptions, borrowers receiving principal forgiveness default less often than those who receive principal forbearance. However, the savings from lower re-default rates are offset by the losses associated with writing off the principal that would be recovered in a successful forbearance modification. The dollar amounts of the benefits for either forgiveness or forbearance modifications in the base analysis and the sensitivity analyses in this section cannot be interpreted in terms of absolute magnitude, because they assume that all underwater borrowers are eligible for modifications. In addition, they involve simple comparisons of forgiveness and forbearance, not detailed simulations of HAMP waterfalls. The analysis, which does not include Treasury subsidies, does give a sense of the relative cost to the taxpayer of principal forgiveness relative to principal forbearance if they were implemented by the Enterprises.

Impact of Treasury Subsidies

The Treasury now plans to subsidize the cost to the Enterprises of principal forgiveness by paying them the investor subsidies previously paid only to private investors[9]. The proposed subsidies are for loans that have not been more than six months past due during the twelve months prior to their evaluation for a modification:

- 30 cents per dollar of principal forgiven down to 140 percent MTMLTV, plus
- 45 cents per dollar of principal forgiven from 140 percent down to 115 percent MTMLTV, plus
- 63 cents per dollar of principal forgiven from 115 percent down to 105 percent MTMLTV.

---

[8] In the base case results, FHFA corrected minor coding errors that affected the January 2012 analysis. These corrections were incorporated in the preliminary results published in April 2012.

[9] On January 27, 2011, Treasury announced its tripling the subsidy amounts previously paid to private investors for forgiving principal (http://www.treasury.gov/connect/blog/Pages/Expanding-our-efforts-to-help-more-homeowners-and-strengthen-hard-hit-communities.aspx).

For loans that have been more than six months past due during the twelve months prior to their evaluation for a modification, Treasury pays investors 18 cents per dollar forgiven regardless of the MTMLTV of the loan. Treasury makes the subsidy payments in three annual installments, conditional on the borrower maintaining good standing (consistent with Treasury rules).[10] Treasury uses taxpayer funds appropriated to it under the Emergency Economic Stabilization Act of 2008 to pay the subsidies.

Analysis 1 shows the impact of the subsidies. In order to expand the number of borrowers assisted and maximize the subsidy benefit to the Enterprises, Analysis 1 assumes forbearance or forgiveness down to 105 percent MTMLTV, rather than 115 percent as assumed in the base analysis. (For HAMP PRA, Treasury pays subsidies for forgiveness down to a minimum of 115 percent and to a maximum of 105 percent.) The other assumptions were the same as those in the base analysis. No other modification tools or HAMP eligibility rules were applied. The subsidies reported reflect the expected payments the Enterprises would receive taking into account the re-default probabilities, prepayments, and discounting of cash flows in the NPV model.

With Treasury subsidies, Analysis 1 shows principal forgiveness benefits the Enterprises by $6.7 billion (column D) more than principal forbearance. Because the Enterprises are supported by the Treasury Department, these savings benefit taxpayers to the extent that they reduce future draws under the Preferred Stock Purchase Agreement each Enterprise has with the Treasury Department. However, the $13.2 billion (column E) cost of the subsidy payments results in a net cost to the taxpayers of $6.5 billion (Enterprise benefit less Treasury subsidy cost). This net cost is shown in column F.

Savings from forbearance modifications (column B) increase from $24.3 billion to $28.0 billion because of the deeper assumed level of forbearance (to 105 percent rather than 115 percent MTMLTV), and the full recovery of principal from loans when the modifications are successful. Savings from forgiveness modifications (column C) increase from $21.0 billion to $34.7 billion, reflecting the increased forgiveness amounts and the offset to Enterprise losses resulting from the Treasury subsidies.

Analyses two through five test the sensitivity of certain base analysis assumptions. Analysis 2 simulates increasing borrower difficulties in meeting debt obligations, as reflected in credit score deterioration[11]. Analysis 3 simulates recession-driven declines in borrower income as reflected in an increased housing payment[12] debt-to-income ratio (DTI). To better capture areas with the worst house price deflation, Analysis 4 utilizes ZIP code level, instead of statewide, house price indexes. Analysis 5 combines analyses 2 through 4 in one set of results.

Sensitivity to Lower Credit Score

Analysis 2 assumes that delinquent borrowers have experienced a 100-point decrease since loan origination in their credit scores. This decrease approximates the impact of a 90-day delinquency on a

[10] Given that the borrower has not re-defaulted on the modified mortgage, the amount forgiven occurs in three annual installments, 1/3 at month 12, an additional 1/3 at month 24 and the last 1/3 at month 36. The NPV model, however, presumes that the forgiven amount occurs in full at the time of loan modification. The effect on MTMLTV, likewise, occurs in the NPV model in full at the time of loan modification. Because the NPV model contains a simplifying assumption that all re-defaults occur 6 months after the modification, the full effect of the forgiven amount is reflected in the re-default estimate, while some defaults, in practice, would occur before the scheduled reduction in principal. Therefore, the model may overstate the benefits of staged principal forgiveness.
[11] The current credit score for each borrower is not available and so a proxy must be used.
[12] Principal, interest, taxes, insurance, and homeowners association fees.

borrower's credit score.[13] In the NPV model, credit scores affect the probability of borrower default and re-default, and lower scores are associated with higher default and re-default probabilities and thus greater losses. As expected, since the analysis lowers credit scores identically for both of the modification options, the increase in the Enterprise benefit (column D) is small—$0.3 billion (from $6.7 billion to $7.0 billion). The taxpayer cost (column F) declines by $0.4 billion (from $6.5 billion to $6.1 billion). The ultimate result, that forbearance provides more of a benefit to taxpayers than forgiveness, does not change.

Sensitivity to Higher Debt-to-Income Ratios

In Analysis 3, the DTIs of delinquent borrowers are raised to levels that might be associated with the experience of credit difficulties.[14] Higher DTI ratios contribute to higher default and re-default probabilities and greater losses in the no-modification, as well as both of the modification scenarios. Since the NPV model applies the same default and re-default equations, and the DTI ratios increase identically for both of the modification options, the results show very little sensitivity to an increase in DTI and do not change the conclusions implied by the preceding analysis. Raising the DTIs of delinquent loans increases the benefit of forgiveness to the Enterprises by $0.1 billion (column D) from $6.7 billion to $6.8 billion and reduces the net cost to the taxpayers by $0.4 billion (column F) from $6.5 to $6.1 billion.

Sensitivity to ZIP Code-Level MTMLTV Projections

For Analysis 4, FHFA applied ZIP code level rather than statewide HPIs. Because a ZIP code level price index is more sensitive to the variations among local housing markets, moving from a state-level HPI to a ZIP code level HPI increases the projected population of loans that are deeply underwater; such as loans with greater-than-115 percent MTMLTV. This increase reflects a greater share of houses in ZIP codes with worse-than-state average house price declines and therefore more homeowners underwater on their mortgages. The loan population increases from 1.4 million in the base analysis and analyses 1 through 3, to 2.6 million in Analysis 4.

In the NPV model, loans with higher MTMLTVs reduce a borrower's opportunity to sell or refinance,[15] leading to higher default and re-default rates. However, loans with higher MTMLTVs also receive larger amounts of principal forgiveness, leading to lower re-default rates. Additionally, principal forgiveness of loans with higher MTMLTVs results in larger investor subsidies paid by the Treasury. Relative to Analysis 1, using a ZIP code level HPI to estimate house values increases the benefit of forgiveness to the Enterprises by $10.9 billion (column D) from $6.7 billion to $17.6 billion. Because the Enterprises would not get the benefit of house price recoveries under principal forgiveness through HAMP PRA, the larger amounts of principal forgiveness increase the net cost to the taxpayers (Column F) by $2.3 billion from $6.5 billion to $8.8 billion.

Sensitivity to Combined Credit Score, DTI, and MTMLTV Adjustments

---

[13] See http://bankinganalyticsblog.fico.com/2011/03/research-looks-at-how-mortgage-delinquencies-affect-scores.html

[14] If the DTI ratio at origination was less than 45 percent, it was raised to 45 percent. If DTI ratio at origination was greater than 45 percent, it was raised to 60 percent.

[15] Provisions of the Enterprises' Home Affordable Refinance Program now allow for the refinancing of high MTMLTV loans.

Relative to Analysis 1 and similar to the individual impacts of credit score, DTI, and MTMLTV adjustments, the combined impacts (Analysis 5) do not change FHFA's conclusions. The benefit to the Enterprises (column D) of forgiveness versus forbearance increases by $10.9 billion from $6.7 billion to $17.6 billion, but the net cost to taxpayers (Column F) increases by $1.7 billion from $6.5 billion to $8.2 billion.

III. Incorporation of the HAMP and HAMP PRA Waterfalls

Table 2
Methodological Changes
Incorporation of the HAMP and HAMP PRA Waterfalls

Standard HAMP Modifications versus HAMP PRA Modifications ($ in billions; loan counts rounded to nearest thousand; totals may not add due to rounding)	**A** Expected Losses, No Modifi-cation	**B** Reduction in Losses, Standard HAMP	**C** Reduction in Losses, HAMP PRA	**D (C-B)** Enterprise Benefit, HAMP PRA versus Standard HAMP	**E** Treasury Subsidy	**F (D-E)** Taxpayer Benefit
Analysis 6 Assumptions: #5, excluding ● Loans with DTIs of 31 percent or lower # of Loans: 2,572,000 Unpaid Principal Balance (UPB): $484.7 billion	$197.3	$42.4	$56.8	$14.5	$18.6	($4.2)
Analysis 7 Assumptions: #6 with ● Only 5 percent of current loans treated as eligible for modification # of Loans: 691,000 UPB: $137.6 billion	$63.6	$9.8	$13.6	$3.8	$5.4	($1.6)
Analysis 8 Assumptions: #6 with ● Only current loans that actually became 2-plus months delinquent from 6/30/2011 to 12/31/2011 treated as eligible for modification # of Loans: 677,000 UPB: $136.3 billion	$63.3	$9.7	$13.4	$3.7	$5.3	($1.6)

While Analyses 1 through 5 compared isolated forbearance and forgiveness alternatives, Analysis 6 and subsequent analyses compare actual standard HAMP and HAMP PRA modifications. In analyses 6 through 8, included in Table 2, column B shows the results of standard HAMP modifications for all loans where the modification is NPV positive and column C shows the results for HAMP PRA modifications for all loans where that modification is NPV positive. (As stated above, losses associated with no modification were applied if the result was NPV negative.) Analysis 6 excludes loans that would not meet HAMP eligibility requirements for DTI[16], in order to show when compared to Analysis 5 only the effect of substituting HAMP waterfall modifications for simple forgiveness/forbearance modifications. Analysis 6 continues to include all current borrowers even though only a small fraction of current borrowers qualify for HAMP modifications. Analysis 7 and those that follow include estimates of the portion of current borrowers that could be eligible for a HAMP modification.

Analyses in tables 2 and 3 tested modifications designed according to the HAMP and HAMP PRA waterfalls and provide a better indication in terms of magnitudes of expected results of HAMP and

[16] They are ineligible for HAMP because the borrower's DTI is less than or equal to 31 percent, which also makes them ineligible for HAMP PRA.

HAMP PRA modifications. Along with the earlier sensitivity analyses presented in Table 1, the results are the product of numerous assumptions, uncertainty, and approximations, and FHFA does not consider small differences in results from one analysis to the next to be significant.

Standard HAMP versus HAMP PRA Modifications

A standard HAMP or HAMP PRA modification is designed using the appropriate "waterfall." After capitalizing arrearages for each loan, the standard HAMP waterfall adjusts one or more loan terms to lower the borrower's monthly payment to achieve a DTI of 31 percent as follows:

1) reduce the interest rate to a minimum of 2 percent, then if necessary;
2) extend the term to maximum of 480 months, and finally, if necessary;
3) forbear principal.

The HAMP PRA[17] waterfall uses the following steps to achieve the same DTI reduction:

1) forgive principal to the minimum of 105 percent MTMLTV or 31 percent DTI and then if necessary;
2) reduce the interest rate to a minimum of 2 percent, then if necessary;
3) extend the term to a maximum of 480 months, and finally, if necessary;
4) forbear principal.

Compared to Analysis 5, Analysis 6 shows that applying the standard HAMP and HAMP PRA waterfalls reduces the benefit to the Enterprises (column D) of forgiveness (as provided in a HAMP PRA modification) compared to forbearance (as provided in a standard HAMP modification) by $3.1 billion, from $17.6 billion to $14.5 billion, but also decreases the net cost to taxpayers (column F) by $4 billion, from $8.2 billion to $4.2 billion.

[17] Treasury pays investor subsidies for forgiveness for any borrowers with MTMLTV greater than 115 percent, but investors are not required to forgive down to 105 percent MTMLTV. FHFA assumed forgiveness to 105 percent to maximize principal forgiveness to borrowers and subsidy payments to the Enterprises.

Refining the HAMP Eligible Population

Preceding analyses included all Enterprise borrowers with MTMLTVs greater than 115 percent, whether or not they had missed a payment. This type of analysis was useful for an isolated and uncomplicated comparison of forgiveness versus forbearance, but not for the comparison of the more complex standard HAMP and HAMP PRA modifications. Analysis 7 (preliminary results made available in April 2012) projects the current borrowers that could be eligible for HAMP as a five percent pro rata share of all current loans; the five percent figure is consistent with the actual experience of the Enterprises' books of business. Of the Enterprise loans outstanding as of June 30, 2011, which were current on December 31, 2010, five percent missed two or more payments during that six-month period and therefore became eligible for HAMP modifications. This adjustment to the current loan population reduced the HAMP-eligible loan population in the analysis from 2,572,000[18] ($484.7 billion UPB) to 691,000 ($137.6 billion UPB), including 99,000 current loans. Consistent with the reduced population of eligible loans, the Enterprise savings from HAMP PRA fell by more than three-quarters (from $56.8 billion to $13.6 billion, see column C). The relative benefit to the Enterprises of HAMP PRA compared with standard HAMP fell proportionately from $14.5 billion to $3.8 billion (column D). The cost to the taxpayer of HAMP PRA compared to standard HAMP declined from $4.2 billion to $1.6 billion (column F). The decline across all columns in Table 2 reflects the much smaller number of current underwater borrowers who would be eligible to receive HAMP modifications.

Actual Transition Experience Used to Estimate HAMP Eligible Loans

In Analysis 8, FHFA confirmed that the five percent pro rata share of current loans used in Analysis 7 was a reasonable estimate for current loans likely to be eligible for HAMP. FHFA reviewed all of the current loans with MTMLTVs greater than 115 percent on June 30, 2011, and identified those that had missed two or more payments as of December 31, 2011. This group included 85,000 loans, compared to 99,000 loans generated with the five percent pro rata approach, and did not materially affect the Enterprise benefit or taxpayer costs.

[18] All loan counts are rounded to the nearest thousand.

IV. Optimal HAMP Modification

Table 3
Methodological Changes
Optimal HAMP Modification

Standard HAMP Modification versus Optimal HAMP Modification ($ in billions; loan counts rounded to nearest thousand; totals may not add due to rounding)	**A** **Expected Losses, No Modification**	**B** **Reduction in Losses, Standard HAMP**	**C** **Reduction in Losses, Optimal HAMP Modification**	**D (C-B)** **Enterprise Benefit, Optimal HAMP Modification versus Standard HAMP**	**E** **Treasury Subsidy**	**F (D-E)** **Taxpayer Benefit**
Analysis 9 Assumptions: #8 with ● Either no modification, standard HAMP, or HAMP PRA, assigned based on maximum NPV (minimum loss) # of Loans: 677,000 Unpaid Principal Balance (UPB): $136.3 billion	$63.3	$9.7	$13.9	$4.3	$4.5	($0.2)
Analysis 10 Assumptions: #9 excluding ● loans ineligible for HAMP for reasons other than DTI <= 31%, with pre-modification DTIs raised to the minimum of 45 percent or origination DTI capped at 60 percent (delinquent loans only) # of Loans: 497,000 UPB: $ 99.3 billion	$45.7	$7.3	$10.4	$3.1	$3.1	($0.0)
Analysis 10A Assumptions: #10 excluding ● loans that have missed 12 or more payments # of Loans: 282,000 UPB: $53.8 billion	$24.4	$4.5	$6.1	$1.6	$2.0	($0.4)
Analysis 10B Assumptions: #10 excluding ● loans that have missed six or more payments # of Loans: 219,000 UPB: $41.2 billion	$18.3	$3.6	$5.0	$1.4	$1.8	($0.4)
Analysis 11 Assumptions: #9 excluding ● loans ineligible for HAMP for reasons other than DTI <=31 percent with pre-modification DTIs adjusted to reflect DTI distribution of loans that received HAMP modifications (delinquent loans only) # of Loans: 497,000 UPB: $99.3 billion	$45.0	$6.6	$10.2	$3.6	$2.7	$1.0
Analysis 11A Assumptions: #11 excluding ● loans that have missed 12 or more payments # of Loans: 282,000 UPB: $53.8 billion	$24.0	$4.1	$6.0	$1.9	$1.7	$0.1
Analysis 11B Assumptions: #11 excluding ● loans that have missed six or more payments # of Loans: 219,000 UPB: $41.2 billion	$18.0	$3.4	$4.9	$1.6	$1.6	($0.0)
Analysis 12A Assumptions: #11, but scaled by 50 percent # of Loans: 248,000 UPB: $49.7 billion	$22.5	$3.3	$5.1	$1.8	$1.3	$0.5
Analysis 12B Assumptions: #11, but scaled by 25 percent # of Loans: 124,000 UPB: $24.8 billion	$11.2	$1.7	$2.6	$0.9	$0.7	$0.2
Analysis 12C Assumptions: #11, but scaled by 15 percent # of Loans: 74,000 UPB: $14.9 billion	$6.8	$1.0	$1.5	$0.5	$0.4	$0.1

Standard HAMP versus Optimal HAMP Modification

In the analyses in Table 3, to compute aggregate savings and costs, FHFA compared the losses resulting from standard HAMP, HAMP PRA, and no modification for each loan and selected the option that resulted in the lowest loss (highest NPV) as the "optimal HAMP modification." Compared to Analysis 8, Analysis 9 shows an increase from $13.4 billion to $13.9 billion in the Enterprise benefit of the optimal HAMP modification over standard HAMP, which results because the lowest loss modification was selected. Likewise, the net cost to the taxpayer is substantially reduced, from $1.6 billion to $0.2 billion (column F), in part because not all borrowers receive a HAMP PRA modification when the optimal modification is used, and the amount of subsidy paid to the Enterprises is lower.

Adjustments for HAMP Eligibility Requirements

Next FHFA sought to determine the effect on results of excluding loans that did not meet a number of technical HAMP eligibility requirements. To this end, FHFA excluded loans with any of the following characteristics:

- Originated after January 1, 2009
- Guaranteed by the Department of Veterans Affairs or Federal Housing Administration
- Financing investment properties or second homes
- Second liens
- Loans that received an earlier HAMP modification.

As shown in Analysis 10, these exclusions reduced the loan population by more than 25 percent from 677,000 to 497,000 loans and reduced the Enterprise benefit relative to standard HAMP from $4.3 billion to $3.1 billion (column D).[19] Here the net benefit to the Enterprises of the optimal HAMP modification of $3.1 billion fully offsets the cost to the taxpayer of Treasury subsidy payments.[20]

Table 4 disaggregates the net taxpayer cost in Analysis 10 by MTMLTV category and borrower delinquency status. The model-based results in the table show that optimal HAMP modifications would benefit the taxpayer predominantly for loans where no payment has been made in more than one year and where the MTMLTV is greater than 140 percent.[21] An important factor affecting the success of loan modifications is whether they are provided to borrowers early in their delinquency.[22] In addition and as noted earlier, the NPV model contains simplifying assumptions that may pose more model risk for seriously delinquent loans than for less delinquent or current loans. This indicates the taxpayer benefit

---

[19] Of the three options, HAMP PRA was the optimal HAMP modification for 78 percent of Enterprise loans in Analysis 10 and 85 percent in Analysis 11.

[20] The simple adjustments to raise DTIs applied in Analysis 3 were slightly modified for Analysis 10 to maintain origination DTIs between 45 percent and a maximum of 60 percent.

[21] FHFA updated Analysis 10 using Enterprise loans outstanding as of December 31, 2011. The numbers in the table changed only slightly and the impact was minimal. The net taxpayer cost increased by $0.1 billion, largely due to the decline in seriously delinquent loans in the portfolio. This increase in taxpayer cost, though slight, is consistent with the findings in analyses 10A and 10B, since seriously delinquent loans generate most of the taxpayer benefit. As in Analysis 7, FHFA assumed a five percent pro rata share of current loans were eligible for HAMP modifications. The results analogous to those in columns A through F in Analysis 10 are $42.3 billion, $7.3 billion, $10.2 billion, $2.9 billion, $3 billion, and ($0.1) billion.

[22] In the NPV model, the lack of success with modifications of seriously delinquent loans is reflected in their higher re-default rates.

accruing from seriously delinquent loans, which accounts for the majority of the overall taxpayer benefit, is less certain.

Given the findings in Table 4, Analysis 10A tested the effect of not providing modifications to borrowers who have missed 12 or more payments, since most such borrowers, if they are not already pursuing a modification, are likely in the process of foreclosure or a foreclosure alternative such as short sale or deed in lieu of foreclosure.[23] Without these borrowers, the expected benefit to the Enterprises decreases from $3.1 billion to $1.6 billion (column D), and the net cost to the taxpayer increases from approximately zero to $0.4 billion (column F).

Table 4
Optimal HAMP Modification versus Standard HAMP Modification
Taxpayer Benefit Analysis by MTMLTV and Delinquency Status
(Based on Analysis 10)

	Delinquency Status ($ in Millions)							
	Current	**1 - 59 Days**	**60 - 89 Days**	**90 - 119 Days**	**120 - 179 Days**	**180 - 365 Days**	**> 1 Year**	**Grand Total**
115% < MTMLTV <=125%	$3	($55)	($26)	($5)	($8)	$4	$21	($65)
125% < MTMLTV <=140%	($5)	($95)	($46)	($14)	($23)	($4)	($15)	($202)
MTMLTV > 140%	$44	($123)	($68)	($4)	($6)	$44	***$353***	***$241***
Grand Total	$42	($273)	($140)	($23)	($36)	$44	***$360***	($26)

DTI Adjusted Consistent with HAMP Experience

FHFA's next analysis tested alternatives to the simple upward adjustments to the DTIs of delinquent borrowers at loan origination. Though FHFA previously applied simple adjustments to raise DTIs to reflect potential borrower credit difficulties, in Analysis 11 FHFA adjusted DTIs to approximate the distribution of those borrowers with Enterprise loans that had been evaluated for HAMP modifications.[24] The expected Enterprise benefit (column D) relative to Analysis 9 declined from $4.3 billion to $3.6 billion. In this test, the net benefit to the Enterprises of the optimal HAMP modification offsets by almost $1 billion (column F) the cost to the taxpayer of Treasury subsidy payments.[25]

[23] The distributions of the June 30, 2011, and December 31, 2011, Enterprise portfolios were compared. There were virtually no differences in the distributions of FICO scores, MTMLTVs or DTIs (the three drivers of default and re-default probabilities in the NPV model). The primary difference between the portfolios was that the share of seriously delinquent loans fell, indicating that seriously delinquent loans either became current (through modification) or liquidated. As a result, the taxpayer cost in Analysis 10 increased from near zero to $0.1 billion. In Analysis 11, the taxpayer benefit decreased from $1 billion to $0.8 billion.

[24] To arrive at adjusted DTIs, FHFA first adjusted payment-to-income ratios (PTIs) of Enterprise loan HAMP applicants (delinquent loans over 115 percent MTMLTV) to reflect the distribution of pre-modification PTIs. Homeowner association fees, taxes, and insurance were added to calculate DTI.

[25] FHFA updated Analysis 11 using Enterprise loans outstanding as of December 31, 2011. The numbers in the table changed only slightly. The net taxpayer benefit decreased by $0.2 billion (roughly 20 percent), largely due to the decline in seriously delinquent loans in the portfolio. Similar to the Analysis 10 update, the decrease in taxpayer benefit is consistent with the findings in analyses 11A and 11B, since seriously delinquent loans generate most of

Table 5
Optimal HAMP Modification versus Standard HAMP Modification
Taxpayer Benefit Analysis by MTMLTV and Delinquency Status
(Based on Analysis 11)

	Delinquency Status ($ in Millions)							
	Current	**1 - 59 Days**	**60 - 89 Days**	**90 - 119 Days**	**120 - 179 Days**	**180 - 365 Days**	**> 1 Year**	**Grand Total**
115% < MTMLTV <=125%	$3	($20)	($10)	$2	$3	$20	$83	$81
125% < MTMLTV <=140%	($5)	($38)	($19)	$1	$1	$28	***$136***	***$104***
MTMLTV > 140%	$44	($12)	($11)	$16	$30	$94	***$606***	***$767***
Grand Total	$42	($70)	($41)	$19	$34	***$143***	***$825***	$952

This is the first analysis to suggest that economic benefits to the Enterprises, as measured by the Treasury NPV model, may offset the cost to the taxpayer of Treasury investor subsidies. However, as was the case in Analysis 10, the benefit is attributable to loans that are more than one year delinquent and have an MTMLTV greater than 140 percent, as shown in Table 5. Analysis 11A shows that excluding borrowers who have not made 12 or more payments nearly eliminates the net taxpayer benefit.

Expected HAMP Borrower Participation Rates

Analyses 12A, 12B, and 12C consider a range of borrower participation, or take-up, rate assumptions using a simple scaling of the results of Analysis 11, which assumed a 100 percent take-up rate. Enterprise data indicate that close to 15 percent of delinquent borrowers receive permanent modifications[26] within two years of missing two consecutive payments. FHFA undertook a separate analysis of borrowers with high MTMLTVs and high DTIs (those likely to qualify for higher amounts of principal forgiveness) who had missed three or more payments. That analysis showed 25 percent to 30 percent of those borrowers received permanent modifications within a year. Because FHFA and the Enterprises continue to work with servicers to improve modification processing, take-up rates are expected to increase, perhaps to as high as 50 percent. The 15 percent and 25 percent take-up rate assumptions in analyses 12C and 12B, respectively, are at the low and high ends of recent experience, while the 50 percent take-up rate in 12A anticipates potential improved servicer performance and heightened borrower interest in potential principal forgiveness modifications. With this higher 50 percent take-up rate, projected taxpayer benefits are reduced by half to approximately $500 million. The 15 percent and 25 percent take-up rates result in proportionally lower taxpayer benefits.

Strategic Modifiers

---

the taxpayer benefit. As in Analysis 7, FHFA assumed a five percent pro rata share of current loans were eligible for HAMP modifications. The results analogous to those in columns A through F in Analysis 11 are $41.7 billion, $6.7 billion, $10.1 billion, $3.4 billion, $2.6 billion, and $0.8 billion.

[26] HAMP and Enterprise proprietary modifications.

FHFA defines “strategic modifiers” as current borrowers who either claim financial hardship or who miss two consecutive mortgage payments to attempt to qualify for HAMP PRA, which includes principal forgiveness. As of June 30, 2011, there were approximately 1.4 million current borrowers[27] with MTMLTVs greater than 115 percent. This analysis attempts to determine how many of these 1.4 million current borrowers would have to become strategic modifiers in order to eliminate the Enterprise and taxpayer benefit of the optimal modification over standard HAMP. Current borrowers have shown the ability and willingness to pay their mortgages, and in this analysis they are expected to continue to do so with or without modification. The loss associated with their strategic modification is only the amount forgiven (for the Enterprises, net of the Treasury subsidy received).

In the preliminary analysis made available in April 2012 (see footnote 3 on page 3), 90,000 strategic modifiers would eliminate the Enterprise benefit of HAMP PRA over standard HAMP. Table 6 incorporates the take-up rates in analyses 12A, 12B, and 12C—50 percent, 25 percent, and 15 percent—and updates and expands the preliminary analysis. The analyses focus only on borrowers for whom the optimal HAMP modification is HAMP PRA (210,000, 105,000, and 63,000 of the 248,000, 124,000, and 74,000 borrowers included in analyses 12A, 12B, and 12C, respectively).

Table 6 shows that as few as 14,000 strategic modifications (only one percent of all potential HAMP PRA eligible current borrowers) to as many as 126,000 (—nine percent of those borrowers) would eliminate the Enterprise benefit of HAMP PRA. This table also shows that as few as 3,000 or as many as 19,000 strategic modifications would eliminate the taxpayer benefit.

[27] The 1.4 million current borrowers who could be eligible for HAMP corresponds to the 497,000 borrowers estimated to be eligible for HAMP in Analysis 10 and Analysis 11, which excluded loans with characteristics not eligible for HAMP.

Table 6
Number of Strategic Modifiers Needed to Offset
Benefit of HAMP PRA Savings
(loan counts rounded to the nearest 1,000)

Eligible Borrower Take-Up Rates			Number of Strategic Modifiers			
Percentage of Borrowers Obtaining HAMP PRA Modifications	**Number of Modifications**	**Optimal Modification Savings Relative to Standard HAMP ($B)**	**Based on Avg. Enterprise Loss, Calculated For All PRA Eligible Loans[a]**	**As a Percent of Potential PRA Eligible Current Borrowers (1.4M)**	**Based on Average Enterprise Loss, Calculated for Only Current PRA Eligible Loans[b]**	**As a Percent of Potential PRA Eligible Current Borrowers (1.4M)**
To Offset Enterprise Benefit						
50%	210,000	$1.8	47,000	3.4%	126,000	9.0%
25%	105,000	$0.9	23,000	1.7%	63,000	4.5%
15%	63,000	$0.5	14,000	1.0%	38,000	2.7%
To Offset Taxpayer Benefit						
50%	210,000	$0.5	9,000	0.6%	19,000	1.3%
25%	105,000	$0.2	5,000	0.3%	9,000	0.7%
15%	63,000	$0.1	3,000	0.2%	6,000	0.4%

[a]The Enterprise benefit offset was calculated using $54,000 average forgiveness amount and $15,000 average Treasury subsidy. The taxpayer benefit offset was calculated using only the $54,000 average forgiveness amount.

[b]The Enterprise benefit offset was calculated using $26,000 average forgiveness amount and $11,500 average Treasury subsidy. The taxpayer benefit offset was calculated using only the $26,000 average forgiveness amount.

V. Conclusion

This paper summarized results of the model-based analysis FHFA undertook to support decision-making concerning Enterprise adoption of HAMP PRA modifications. Initially, FHFA focused on understanding the relative economics of principal forbearance and principal forgiveness in isolation. Results showed that principal forbearance resulted in lower losses than principal forgiveness. Various sensitivity analyses did not change the relative result.

FHFA then refined the analysis to capture features of the HAMP modification process and to estimate the eligible population. In particular, FHFA tested the alternative of applying the optimal HAMP modification (the action with the lowest Enterprise loss or highest NPV, whether no modification, standard HAMP or HAMP PRA), under two scenarios of assumed borrower DTI distributions—analyses 10 and 11. Analysis 10 projected a break-even result for taxpayers, with the Enterprise benefit of $3.1 billion offset by a $3.1 billion Treasury subsidy. Analysis 11 showed an Enterprise benefit greater than the Treasury subsidy required to fund it—$3.6 billion benefit offset by a $2.7 billion subsidy. Here the net taxpayer benefit was approximately $1 billion. Assuming 100 percent of eligible borrowers receive a modification, the range of potential taxpayer benefit is between zero and $1 billion.

In either case, the benefit is overstated for at least two reasons. First, FHFA expects a take-up rate of no higher than 50 percent, that is, the percent of eligible borrowers who apply, complete the trial period, and receive a permanent modification. With 50 percent take-up, FHFA's model-based analysis projects the net taxpayer benefit between zero (Analysis 10) and $0.5 billion (Analysis 11), with correspondingly lower benefits for take-up rates more consistent with historical experience. Second, the largest benefit is from borrowers who have MTMLTVs above 140 percent and who have not made payments in more than 12 months. Recent HAMP experience has shown that the key to successful modifications is to reach borrowers early, so relying on borrowers who have not made any mortgage payment for significant amount of time as the primary source of benefit is questionable.

Finally, FHFA's analysis shows that small numbers of strategic modifiers would eliminate the Enterprise and taxpayer benefit. FHFA found that even with 50 percent take-up rates, it would take only three percent to nine percent of all Enterprise deeply underwater current borrowers to strategically modify in order to eliminate the Enterprise benefit, and only 0.6 percent to 1.3 percent of such borrowers to eliminate the taxpayer benefit of the optimal HAMP modification versus the standard HAMP modification the Enterprises use now. Those percentages are even smaller for take-up rates more in line with historical experience.

Given the imprecision of the analytical tools available, the small and potentially shrinking number of borrowers who might be helped, reliance on aged delinquent loans to provide benefits, and the tenuousness of the Enterprise and taxpayer benefits in the event of strategic modification, FHFA believes its model-based analysis does not support the Enterprises' implementation of HAMP PRA. FHFA's decision is also based on factors that are not considered in a model-based analysis reported in this paper—the costs, risks, and time required to implement HAMP PRA, as well as the forgone opportunities resulting from diversion of effort away from other broader initiatives designed to help larger numbers of borrowers and improve the efficiency of Enterprise operations.