



## A Quantitative Comparison of Alternative Loan Modification Strategies

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About the Author: Ray Meadows is the founder of The Recovery Company and a sister company called Recovery Partners. He has worked in real estate and finance for over 15 years at Wells Fargo Bank and Citigroup among others. Most recently he has served real estate investors at his real estate brokerage and investment advisory firm, Berkeley Investment Advisors.

Recovery Partners has developed a systematic method for optimizing loan modification offers which takes into account the effects of high loan balances on the willingness of the borrower to keep paying the mortgage. These offers require appreciation sharing to minimize the moral hazard effects of offering principal reductions.<sup>1</sup> For purposes of this paper we will ignore the value of appreciation sharing arrangements as well as second order effects. This paper's objective is to demonstrate that current loan modification procedures used by the major loan servicers are sub-optimal compared to an alternative modification strategy which sets offers based on predictions of borrowers' sensitivity to negative equity. Investors purchasing defaulted mortgages from banks can earn large profits by using this superior strategy to correct failed bank modifications. We will make use of Monte Carlo simulation to quantify the potential benefits of this alternative loan modification strategy.

In our prior white paper we showed that the present-value of foreclosure recoveries are 25% to 41% below appraised values. Lenders are attempting to boost recoveries by reducing loan payments rather than foreclosing but so far there are no large scale efforts to address defaults motivated by loan amounts in excess of the house value. Banks seem to believe that it is better to foreclose in these cases - possibly because of concerns about 2<sup>nd</sup> order effects: the potential such concessions have for inducing additional defaults within the loan portfolio. For distressed debt buyers without an existing portfolio of good loans to worry about, a more sophisticated loan modification strategy is always better. Furthermore, banks could offset the incentives for current payers to default by requiring that the borrower give up a large share of future appreciation in return for the current principal reduction.

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<sup>1</sup> See "Maximizing Recovery Value by Avoiding Foreclosure: A Win-Win Approach" for the details of implementing Equity Based Modifications and a discussion of the motivation behind this approach.

## The Essence of Loan Default Decisions

Two things are necessary for a borrower to continue paying his loan: ability to pay and willingness to pay. Both of these characteristics vary throughout the population of borrowers.<sup>2</sup> Therefore, for any particular borrower that we observe, these characteristics are random variables.

When a bank observes a borrower's income, the bank's underwriting criteria sets a maximum loan payment for which the borrower qualifies. Under current modification procedures the lender will modify the loan to match this payment amount if the present value of such a modification exceeds the estimated foreclosure value. This new payment stream can be discounted at current market rates to find the equivalent implied principal for a new loan. In turn this new loan amount divided by value of the borrower's house is his new modified loan to value (LTV) ratio. Thus we are interested in the borrower population's probability distribution for income and the closely related "maximum LTV qualified for" characteristic.

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*Maximum Loan  
Qualification  
Determines Ability to  
Pay.*

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To keep things simple we will assume that banks are capable of correctly setting maximum LTV qualification standards. Therefore we assume that defaults related to ability to pay are negligible so long as loans are set at or below the maximum amount that a borrower is qualified for. Even if this is not the case it will not invalidate our conclusions.

Besides life circumstance changes which affect borrowers' ability to pay, academic studies<sup>3</sup> identify property values as the second main factor driving default behavior. Evidence clearly shows that declines in home values lead to increased defaults. When a borrower has positive equity in their home that exceeds the cost of selling, they will almost always sell the home to pay off the mortgage rather than allow a bank to foreclose and deprive them of their equity. The diversity of the borrower population

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<sup>2</sup> Dispersion of income is well documented. The dispersion of the "willingness to pay" characteristic has been less well documented but can be inferred from the pattern of re-defaults on loans that have been modified to address affordability. Also see "Reducing Foreclosures: No Easy Answers" a May 2009 working paper by Foote, Gerardi, Goette, and Willen. This paper provides evidence that affordability cannot be the only explanation for the default behavior observed.

<sup>3</sup> See "Residential Mortgage Default" by Ronel Elul published by the Federal Reserve Bank of Philadelphia for a survey of the literature.

*We use borrowers' maximum negative equity limits as our measure of willingness to pay.*

guarantees that there will be some borrowers who will stop paying their mortgage as soon as they realize they have no equity in the home, while other borrowers will keep paying regardless of how much their loan exceeds their home's value. In the middle of these two extremes are borrowers whose willingness to pay the loan is determined by the amount of negative equity they have in relation to the value of the house. Thus our measure of the variable determining willingness to pay is borrowers' maximum negative equity limit as a percentage of the house value. For example, if I observe a borrower who keeps paying his mortgage as his house value declines but then defaults when the loan exceeds the house value by 20%, then this borrower's maximum negative equity limit *was* 20% for this default. Note that this limit may change through time and may be influenced by many other underlying variables.

### **House Value Changes**

Because house values enter directly into our measure of willingness to pay, we need to take into account how they may change through time in order to determine the effects on willingness to pay and therefore re-defaults on modified loans. Home price movements are specific to location but are correlated due to linkages to macroeconomic factors. Our simulation will utilize an overall average home price change each quarter out to our simulation horizon and add a random component specific to each house. The Case-Shiller forecast model produces housing price forecasts and the probability distribution of forecast errors is publicly disclosed. Therefore, for our simulation we will calculate individual house price changes by taking our mean forecast and adding to it a random "error" component based on the error probability distribution published for the Case-Shiller forecasts.

### **Recovery Partners' Modification Offer Calculation**

Our goal is to determine a modification offer that will induce a willingness to pay in the borrower, both at the date of the modification and forward in time through the bottom in the housing market. A calculation of an optimal offer for a particular borrower requires that we know that borrower's negative equity limit beyond which he will default. Since this quantity is not directly observable, we use an estimation model to predict this quantity based on observable data. Thus we will experience some forecast error when setting modification terms. Thus the variable

of interest for this simulation is our forecast error when we try to predict borrower sensitivity to negative equity.

### Simulation Set Up

As discussed above we have 4 random variables to simulate for every loan modification decision that we analyze:

1. Maximum Loan Qualification
2. Maximum Negative Equity Limit
3. House Price Changes
4. Maximum Negative Equity Limit Forecast Error

In all cases we will assume that foreclosure results in a recovery equal to 70% of the house value as of the date of the foreclosure decision. The 30% loss is a combination of repairs, insurance, property tax, selling costs, quick sale discount, and time value of money. Based on this foreclosure value and the four variables simulated, we will determine the bank's modification and foreclosure decisions and likewise the decisions using the alternative loan modification strategy of Recovery Partners. Then, based on these decisions we calculate recoveries for the two strategies at four points in time: the decision date, one quarter forward, two quarters forward and one year forward. The last is meant to represent the bottom of the market.

*Each Monte Carlo simulation run compares results for the two strategies applied to a portfolio of 1,000 loans. We use 1,000 runs in calculating statistics for the results.*

Each simulation run provides the decisions and resulting recoveries on a portfolio of 1,000 loans – each with its own unique set of the four random variables. We start with a base case set of parameters that describe how the random variables are generated and then we examine the sensitivity of the results to changes in the parameter set.

### The Probability Distribution of House Price Changes

We start with a mean forecast path for house price changes:

Quarter:	1	2	3	4
Change:	-3%	-3%	-2%	-2%

When calculating optimal modifications such a forecast will be obtained from Case-Shiller for example. Case-Shiller publishes the probability distribution of errors for their forecasts and we use this probability distribution for our simulation of housing prices.

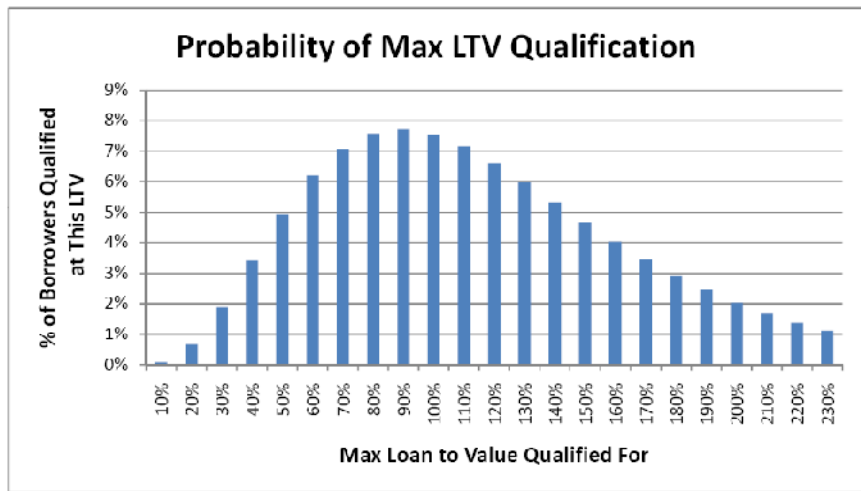
### Borrower Characteristics - Probability Distribution Assumptions

In specifying probability distributions for the maximum amount that borrowers qualify to borrow (as a percent of their house

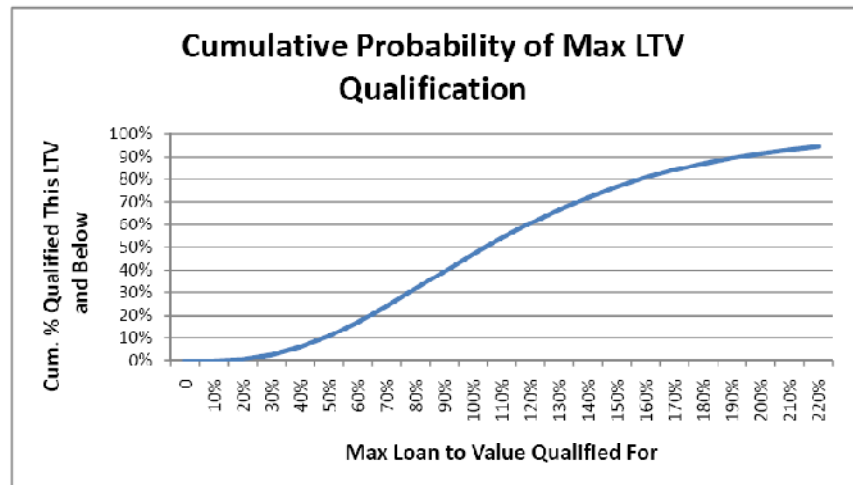
value) and the maximum negative equity limit before a borrower defaults, we want distributions that have mean and variance that make sense in the context of what we are simulating. For any given portfolio these distributions will vary. We will examine the effects of varying the distribution assumptions after analyzing the base case assumptions.

**The Borrower Income Probability Distribution**

Our base case distribution for the borrower income (and maximum loan qualification) is stated in terms of each borrower’s new maximum LTV ratio. I.e. his income implies a maximum payment which translates into the maximum loan amount using current interest rates and this loan amount is divided by the value of the borrower’s house. Our base case Maximum LTV distribution has mean = 113% and standard deviation = 34%.



Another way to evaluate this is to look at the cumulative probability distribution shown below.

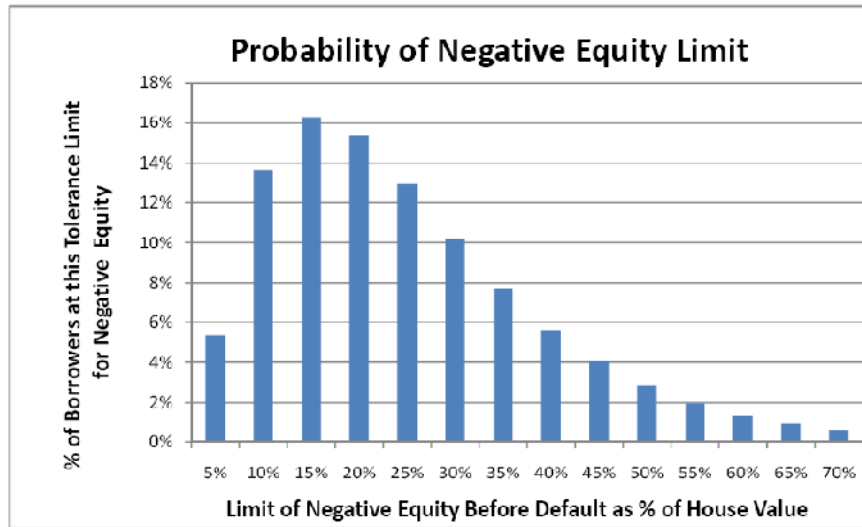


The cumulative probability distribution shows the percentage of the population that cannot afford a larger LTV than the point on

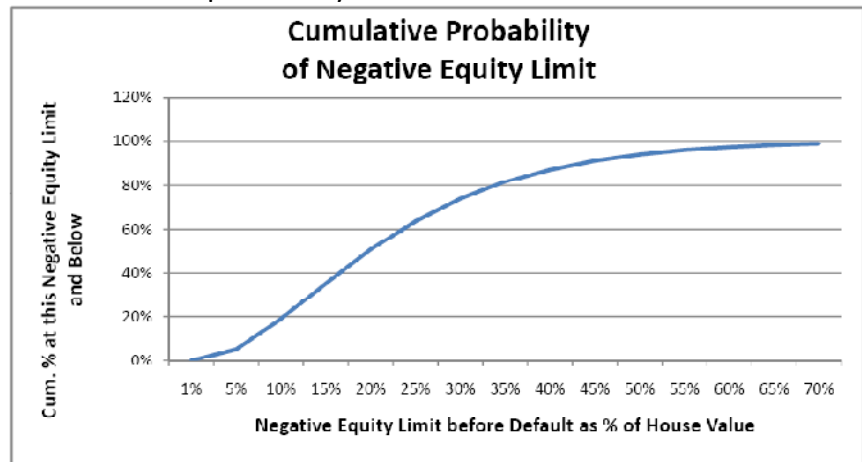
the horizontal axis. Thus the 24% of the population at the 70% point and below (the foreclosure value) is the portion that will be foreclosed upon immediately since they can't afford enough to justify a modification. This is true for both the Banks' modification rules and Recovery Partners' strategy.

This may seem like a very high percentage for foreclosures but keep in mind that we are focused on the subset of the population of borrowers who have already defaulted on their mortgages – not the general population. (I.e. we can expect defaulters to have lower incomes relative to their house value, on average, compared to the general population).

**The Probability Distribution for Maximum Negative Equity Limit**  
 Our base case distribution for the Maximum Negative Equity Limit has mean = 23% and standard deviation = 15%.



The cumulative probability distribution is shown below.



The graph gives the percentage of the population that will default if negative equity reaches the point on the horizontal axis. This distribution shows that no one defaults right away but that virtually everyone does so once negative equity hits 65% of the house value. Again, keep in mind that these borrowers are the subset of the population which has already defaulted once.

### **The Distribution of Max Negative Equity Forecast Errors**

Recovery Partners cannot perfectly predict borrowers' maximum equity limits. Our forecast errors should be distributed normally with a mean of zero and a standard deviation of 4% of house value. Thus we expect 95% of the time our forecast will be within 8% of the true value (i.e. + or - 1.96 standard deviations).

### **Foreclosure and Modification Decision Logic**

In our simulation the bank compares the borrower's maximum LTV qualification to the foreclosure value at the decision date (70%). If the maximum LTV qualification falls below 70%, the bank forecloses immediately; otherwise the bank modifies the loan so that the new LTV is equal to the borrower's maximum qualification amount.

Using the Recovery Partners' modification strategy yields exactly the same foreclosure decisions at the modification date as for the bank – meaning that we would also foreclose on borrowers with insufficient income to support a loan amount equal to 70% of the house value. When modifying loans however, the Recovery Partners' strategy has two steps. First we set a loan amount based on the borrower's income just as the bank would. Next we set a loan amount (and therefore LTV) that takes into account willingness to pay by using a forecast of the maximum negative equity limit. The modification offer is the lower of the two loan amounts. More specifically, for the base case assumptions, the Recovery Partners method will not set LTV higher than 79% plus the forecast of the borrower's maximum negative equity limit.

### **Calculating Recoveries**

All loans foreclosed immediately result in recoveries equal to 70% of house value. Subsequent foreclosures result in recoveries equal to 70% of the house value observed at the foreclosure date.

Subsequent to the modification date, borrowers whose loans were modified observe their LTV as their house value changes

through time and default if the LTV exceeds their Maximum Negative Equity Limit. Thus the borrower can default at quarter one, quarter two, or one year after the modification date.

If the modified LTV is such that the borrower does not default by the end of one year, the recovery amount for that loan is set equal to the modified loan amount as of the modification date.

### Key Results for the Base Case

We run the portfolio simulation 1,000 times and calculate statistics for the key results from the 1,000 runs.

In analyzing results we are most interested in those loans for which the loss mitigation strategies differed. In cases where the borrower's income is the controlling variable for the decision under Recovery Partners' strategy, the decision is identical to that of the bank and recoveries are identical.

*The Base Case Analysis indicates that the alternative modification strategy of Recovery Partners increases recoveries by an average of 35% for the set of loans where modification offers differed.*

To provide context we first report the percentage of loans foreclosed immediately under both strategies and the percentage of loans for which modification offers differed between the two strategies. Then, focusing on the subset of loans with different results we calculate **the percentage increase in recoveries** using Recovery Partners' strategy compared to recoveries using bank modification logic. This is our key result as it measures the value added by using the alternative modification strategy developed by Recovery Partners. After our key metric, we also show the percentages of differing modifications where the bank method did better and the percentage where Recovery Partners' method did better. Finally we calculate the overall portfolio recovery gain from using the alternative strategy. Note that the more identical decisions there are, the lower this number becomes.

Description	Avg.	Std. Dev.	Min	Max
% immediately foreclosed	24%	1%	19%	30%
% of loans with differing mod. Offers	52%	2%	46%	57%
<b>Recovery increase % on differing mods</b>	<b>35%</b>	<b>1%</b>	<b>31%</b>	<b>40%</b>
% of differing mods where bank did better	18%	2%	13%	23%
% of differing mods where alternative better	80%	2%	75%	86%
Total portfolio % gain for Recovery Co.	16%	1%	14%	19%

We also note that our observed pattern of post modification defaults for simulated modifications using the bank method come rather close to the real world data - as reported in the quarterly

Mortgage Metrics report published by the Comptroller of the Currency. Specifically, we see re-defaults exceeding 50% three months after modification.

### **Sensitivity Analysis for Simulation Parameters**

In order to test whether the results above are valid for various other plausible sets of parameters, we varied the specifications and re-ran the simulations. Our goal is to show that it is the *logic* of the modification strategy that creates value here and that the effects of our population parameters are minor in comparison. See Appendix A for a complete listing of summary statistics for all the parameter variations discussed below.

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*The Results are  
Relatively Insensitive  
to Borrower  
Population  
Parameters.*

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#### **Changing the Income Distribution**

First we increase the mean of the Maximum LTV Distribution from 114% to 128% and reduce the standard deviation from 34% to 31%. This change reduces foreclosures from 24% in the base case to 13% and there is a corresponding increase in the percentage of loans with differing modification offers. Because maximum LTV does not come into play for the loans with differing modifications, this change in distribution parameters causes an insignificant 1% increase in the recovery increase % for the Recovery Partners method.

#### **Changing the Negative Equity Limit Distribution**

We increased the mean of the distribution from 23% to 33% while boosting the standard deviation from 15% to 20%. Thus we are looking at the result of an overall higher tolerance and an increase in dispersion of the sensitivity to negative equity. The result is that the maximum LTV will more frequently be the constraint on the loan modification so that the percentage of differing modifications drops from 52% to 45%. At the same time however, the higher tolerance for negative equity leads to larger per loan benefit from the two factor modification strategy so that the percentage increase in recoveries for differing modifications goes up to 42% from 35%. Shifting this distribution towards lower tolerance yields unrealistically high re-default rates for bank modifications.

#### **Increasing the Standard Deviation of the Negative Equity Limit Forecast Error Distribution**

What if Recovery Partners forecast error for borrowers' negative equity limit is much larger than expected? Running the simulation with the standard deviation of the forecast error doubled to 8%

yields a drop in recoveries. Specifically, the recovery increase percentage for loans with differing modifications dropped to 29% from 35%. Again we see that results are only modestly affected even for a major change in parameters – further evidence that results are structurally driven not data driven.

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*A More Drastic Drop in House Prices than Expected Could Require Further Modifications to Mitigate Foreclosure Losses under the Proposed Alternative Method*

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### **Changing the Forecast Mean Decline in Housing Values**

Next we reduced the mean forecast decline in house prices over the one year horizon to a drop of 5% from 10%. This change reduced the percentage of loans with differing offers from 52% to 48% but boosted the recovery increase percentage for differing decisions from 35% to 41%. The lower expected decline in house values allows us to set higher LTV's and still avoid later foreclosures under Recovery Partners' modification method.

When we doubled the mean forecast decline in house prices, the result was a large reduction in the benefits of the alternative modification strategy because we set lower LTVs at modification and because later foreclosure recoveries are much lower than the corresponding bank foreclosures that occur shortly after modification. This dropped our key metric, recovery percentage increase, down to 24%. Increased foreclosure losses could be mitigated by a 2nd round of modifications if there is a larger downward move in house prices than currently anticipated.

About the Recovery Partners:  
Recovery Partners is a group of finance and real estate professionals that have come together to propose a proactive approach to stopping foreclosures which will benefit all parties relative to the status quo. The company utilizes sophisticated mortgage and real estate analytical software combined with efficient workflow management to deliver fast, profit maximizing turnarounds on loans otherwise headed for foreclosure.

### **Conclusions**

Loan modification programs that base decisions only on ability to pay while ignoring factors affecting willingness to pay will continue to suffer high re-default rates so long as the modified loans result in loan to value ratios above 100% for significant numbers of borrowers. This paper has demonstrated that the logic of a methodology that sets terms by taking into account borrower sensitivity to negative equity will significantly increase recoveries for a large portion of loans. This conclusion is valid for a very wide range of plausible characteristics for the relevant variables. It is highly improbable that borrower characteristics in the real world would deviate materially from the parameter sets used to prove the validity of this alternative approach.

Buying defaulted residential loans from banks at discounts to foreclosure value and using the alternative modification algorithm analyzed here will be a very profitable strategy for investors.



## Appendix A

### Base Case Assumptions

### Statistics for Key Results

Description	Std.			
	Average	Dev.	Min	Max
<b>Base Case Assumptions</b>				
Recovery Increase % for loans where decisions differed	35%	1%	31%	40%
% of loans foreclosed at time 0 (not modified)	24%	1%	19%	30%
% of loans with differing modification offers	52%	2%	46%	57%
% of differing modification offers where Recovery Co. did better	80%	2%	75%	86%
% of differing modification offers where Bank did better	18%	2%	13%	23%
Total portfolio % increase in recoveries for Recovery Co.	16%	1%	14%	19%
<b>Increase Mean but reduce Variance of Max LTV Distribution</b>				
Recovery Increase % for loans where decisions differed	36%	1%	32%	39%
% of loans foreclosed at time 0 (not modified)	13%	1%	10%	17%
% of loans with differing modification offers	63%	2%	59%	68%
% of differing modification offers where Recovery Co. did better	81%	2%	76%	86%
% of differing modification offers where Bank did better	18%	2%	13%	22%
Total portfolio % increase in recoveries for Recovery Co.	20%	1%	18%	23%
<b>Increase Mean and Variance of Neg. Equity Limit Distribution</b>				
Recovery Increase % for loans where decisions differed	42%	2%	37%	47%
% of loans foreclosed at time 0 (not modified)	24%	1%	19%	29%
% of loans with differing modification offers	45%	2%	40%	52%
% of differing modification offers where Recovery Co. did better	77%	2%	70%	84%
% of differing modification offers where Bank did better	21%	2%	14%	28%
Total portfolio % increase in recoveries for Recovery Co.	16%	1%	13%	20%
<b>Double the Standard Deviation of the Neg. Equity Limit Forecast Error Distribution</b>				
Recovery Increase % for loans where decisions differed	29%	1%	24%	34%
% of loans foreclosed at time 0 (not modified)	24%	1%	20%	30%
% of loans with differing modification offers	53%	2%	48%	58%
% of differing modification offers where Recovery Co. did better	74%	2%	68%	81%
% of differing modification offers where Bank did better	24%	2%	17%	30%
Total portfolio % increase in recoveries for Recovery Co.	13%	1%	11%	16%
<b>Double Average Home Price Drop</b>				
Recovery Increase % for loans where decisions differed	24%	1%	20%	28%
% of loans foreclosed at time 0 (not modified)	24%	1%	20%	29%
% of loans with differing modification offers	59%	2%	54%	64%
% of differing modification offers where Recovery Co. did better	75%	2%	68%	82%
% of differing modification offers where Bank did better	22%	2%	17%	28%
Total portfolio % increase in recoveries for Recovery Co.	12%	1%	10%	15%
<b>Cut Average Home Price Drop in half</b>				
Recovery Increase % for loans where decisions differed	41%	1%	37%	45%
% of loans foreclosed at time 0 (not modified)	24%	1%	20%	29%
% of loans with differing modification offers	48%	2%	44%	53%
% of differing modification offers where Recovery Co. did better	82%	2%	76%	86%
% of differing modification offers where Bank did better	17%	2%	12%	23%
Total portfolio % increase in recoveries for Recovery Co.	17%	1%	15%	20%