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Homeownership for the Long Run: An Analysis of Homeowner Subsidies

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An Analysis of Homeowner Subsidies

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This paper examines the impact of interest-rate and down-payment subsidies on default rates and losses given default, and finds that down-payment subsidies create successful homeowners at a lower cost than interest-rate subsidies.

JEL codes: H53, I38, R31.

Key words: mortgage default, interest rate subsidy, downpayment subsidy, housing finance policy.

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I. Introduction

The notion that homeownership contributes to social harmony and to individuals' happiness and welfare is deeply rooted in the American psyche. Consequently, encouraging, subsidizing, and protecting homeownership are deeply ingrained in public policy.

Under the assumption that we will continue to subsidize homeownership as a nation, this paper examines the homebuyer subsidies directed toward households with low-to-moderate income. More specifically, I focus on the effectiveness of the two main delivery mechanisms: interest-rate subsidies and down-payment assistance.[1] Earlier comparative research on subsidies emphasized their impact on affordability rather than their sustainability. For example, the tenure-choice literature has found that many potential homebuyers are constrained by their lack of a sufficient down payment. Therefore, down-payment assistance is more effective than interest-rate subsidies in influencing home-purchase decisions, not just here in the U.S. but also abroad (Gobillon and le Blanc, 2008; Hegedüs et al., 2004; Quercia et al., 2000; also see Feldman, 2001 for a comprehensive review of the tenure-choice literature). However, following the recent crisis, attention shifted from the purchase decision to the sustainability of homeownership. On this front, two questions need to be addressed: First, what is the impact of each type of subsidy on loan performance in low-to-moderate-income (LMI) areas? Second, what is the cost of such subsidies to the taxpayer?

On the first question, I find that a 1-percent decline in interest rates is associated with a 0.75-percentage-point decline in default rates over 15 years. To achieve the same reduction in default risk, LMI homebuyers would need a supplemental down payment of $3,200. On the second question, I find that the total resources needed to enable all such borrowers to pay in an extra $3,200 down payment are well below the cost of the 1-percent-interest-subsidy program over a 15-year period. In addition to lower costs, what makes the down-payment program attractive is that it would create more than 541,000 new homebuyers compared to the 74,000 that would be created through the interest-rate subsidy. Even after accounting for renters who become homeowners as a result of the interest-rate subsidy, the cost of the down-payment program still trails that of the interest-subsidy program by 23 percent. After the expansion in homeownership

[1] Lower interest costs can also be achieved through FHA mortgage insurance funded by premiums paid by borrowers, although this does not constitute a subsidy if the insurance is properly priced.

and the losses of defaulting borrowers are accounted for, each successful (non-defaulting) borrower costs $3,252 in supplemental down payment or $4,391 in interest-rate subsidy.

The cost of either subsidy to the taxpayer clearly depends on program parameters. Under the current housing finance policy, the interest-rate subsidy often takes the form of a federal mortgage-interest tax deduction and its cost is fully borne by the taxpayer. However, this type of deduction is unavailable to most lower-income households who take the standard deduction.[2] Down-payment assistance is provided at the local level through nonprofit organizations using a combination of public *and* private funds. In other words, while higher down payments do require larger resources at origination—compared to an interest subsidy disbursed over time—the full cost is not necessarily borne by the taxpayer.

The main contribution of this paper is that it offers a way to compare alternative subsidy delivery mechanisms if we choose to preserve homeownership as a housing policy goal. The remainder of the paper evaluates the subsidies. The questions of *whether* homeownership should be subsidized and, if so, by how much, are beyond the scope of this paper.

II. Data and Method

In this section, I examine how homeowner subsidies affect loan performance and how much they cost. The primary data source is the LPS Applied Analytics' loan-level mortgage-servicing data for loans originated in the 2002–04 period and tracked until December 2005. Two factors determine the choice of origination years. First, as Demyanyk and Van Hemert (2009) have documented, mortgage underwriting standards declined steadily over many years before the beginning of the crisis. After the mortgage market stabilizes, the terms and performance of the loans originated near the peak of the housing bubble are unlikely to be observed again. Based on this assertion, I exclude originations in the years 2005 and later. The second factor is data availability: The market coverage of servicing data is thin before 2003. Yet, given that the dataset is already limited to years 2004 and earlier by the first factor, I settle on 2002 through 2004 as my preferred origination years. The observation period ends in December 2005 to dissociate loan performance from the last hurrah and the bursting of the housing bubble and the

[2] In 2007, taxpayers reporting income below $50,000 (approximately the median U.S. income) received 4.1 percent of the subsidy's value, while those earning more than $100,000 received 73 percent of its value (Ventry, 2009).

effects of the financial crisis. Admittedly, it is impossible to completely disentangle the effect of the crisis on loan performance and determine how the loans would have behaved in a "normal" market. I will discuss this issue in greater detail in the next section.

There are 5,782,120 first-lien, home-purchase mortgages for owner-occupied properties in the sample. Keeping in mind that the cost of any program is a major issue, I restrict the availability of subsidies to zip codes with median family incomes that are below the national median ($55,832), loan amounts below the FHA limit for low-price markets in 2005 ($172,632), and home values below the median home value in 2005 ($211,700). Obviously, these are subjective limits and not intended as a policy recommendation. With these restrictions, there are 2,776,072 loans in the sample.

II.a. Method

The LPS Applied Analytics dataset contains information on loan characteristics at the time of origination as well as during the life of the loan (see table 1). Using these characteristics, the estimation strategy involves predicting the probability and timing of default over a 15-year period if interest rates are subsidized by 1 percentage point for LMI borrowers. Then, I estimate the amount of down-payment assistance that would produce the same default pattern as an interest-rate reduction. Given that both types of subsidies have the same default pattern, the second stage of the analysis involves estimating the net cost of the subsidies, taking into account not just the money that has to be spent but also the savings from lower losses.

Loans disappear from the sample for three reasons: loan default, prepayment, or the servicer's sale of servicing rights. I investigate default and prepayment with a gamma hazard model.[3] In the loan-default model, the hazard is defined as a delinquency period of 90 days or more. Prepayments and loans that are sold or outlast the observation period are treated as censored observations. In the prepayment model, the prepayment is the hazard; defaults and other loans are treated as censored observations. Both models have the form

$$\log T_i = \beta_1 x_{1i} + \ldots + \beta_k x_{ki} + \sigma \varepsilon_i \qquad (1)$$

[3] Data reject a proportional hazard assumption. The gamma model provides the best fit compared to other distributions as measured by the log-likelihood.

where T_i is the hazard time from origination and the x's are the covariates defined in table 1. Table 2 presents the sample statistics.

To estimate model (1) and predict the prepayment and default probabilities of the subsidized loans in the sample for each month, I split the sample into two groups, one for the estimation and one for the predictions. The estimation subsample consists of a randomly chosen one-third of all the loans, and the prediction subsample consists of the remainder.[4]

The subsidies are introduced to the prediction sample, either by reducing the loans' interest rate by 1 percent or by keeping the interest rate at its original level but reducing the origination amount by a supplemental down payment that generates a default profile equivalent to that of the interest-rate subsidy. After the predicted default and prepayment probabilities are determined in each month, a random draw from a uniform distribution—with support over [0,1]—is used to determine whether a loan is prepaid, is in default, or survived the period. The prepayment and default behavior of the loans is predicted for 180 periods (through the end of 2017), using their original characteristics as well as the subsidized loan terms. In a market that appreciated at its historic rate before the housing boom (the average of the 1980–2000 period), there was usually enough equity in the house after 180 periods to allow defaults without any loss to the lender. Each sample is simulated 100 times to obtain a distribution of outcomes.

As mentioned earlier, events after December 2005 are excluded from the estimation sample. Default rates show a sharp increase in 2007 and 2008 for all origination-year cohorts. Survival models of any distributional form provide an extremely poor fit to the data. For example, predicted default rates in 2008 are about 6 percentage points above the actual default rates in the data. Note that the purpose of this paper is not to make accurate predictions about default rates in a crisis but to predict the effect of subsidies on default rates in a more "normal" market. So by ending the observation period in December 2005, I partly undo the impact of the crisis. Using this method, predicted default rates in 2008 are 1 percentage point below actual defaults.

The data presents some unique challenges. The first is the large number of missing observations in some critical variables, which creates sample-selection issues. Missing values in borrowers' debt-to-income ratios, credit histories, and completeness of loan documentation are of primary

[4] Results are robust to differences in the way the sample is split for estimation and prediction.

concern because of the obvious relationship between these variables and the loan's survival probability. I deal with this problem by including an inverse Mill's ratio for each of the three variables as a covariate. Each inverse Mill's ratio, $\hat{\lambda}_Y$, is estimated from the following probit model, where *Y* is an indicator dummy for a missing debt-to-income ratio, a missing credit history, or missing information on loan documentation.

$$\Phi^{-1}\left(\Pr(Y)\right) = \mathbf{X_Y}\boldsymbol{\beta}_\mathbf{Y} + \varepsilon_Y \tag{2}$$

For the sake of brevity, I do not present these results, but I calculate the inverse Mill's ratio as

$$\hat{\lambda}_Y = \phi(\mathbf{X_Y}\hat{\boldsymbol{\beta}}_\mathbf{Y}) \Big/ \left(1 - \Phi(\mathbf{X_Y}\hat{\boldsymbol{\beta}}_\mathbf{Y})\right) \tag{3}$$

Proper identification requires finding instruments correlated with the missing observations but uncorrelated with the error term in the hazard model. Unfortunately, all variables in the LPS Applied Analytics dataset are chosen to capture factors that are relevant for the hazard rates. Consequently, I have to rely on functional form for identification.

A univariate analysis of the data reveals that, on average, observations with a missing debt-to-income ratio have smaller loan sizes, are less likely to have prepayment penalties or negative amortization, and are more likely to have a balloon payment than observations with valid data. Those with incomplete documentation have higher loan-to-value ratios and loan amounts but a lower likelihood of having a prepayment penalty, balloon payment, or negative amortization. Those with missing FICO scores are smaller in size and shorter in maturity. They are less likely to have a prepayment penalty or negative amortization but more likely to have a balloon payment. It is likely that these missing values are caused by a particular servicer's not reporting these variables; unfortunately, servicer identity is not available in the LPS Applied Analytics dataset. $\mathbf{X_Y}$ includes the variables stated above for each Y.

A second data challenge is the need to create a mortgage-rate history for every loan. The amount of the interest-rate subsidy in each month depends on the outstanding loan amount, which, in turn, depends on the history of mortgage rates. In the actual data, the rate history ends when the loan is prepaid or defaults. However, in the simulations, a subsidized loan is likely to survive beyond its actual survival time. This does not pose any problem for fixed-rate mortgages, but the series must be recreated for adjustable-rate mortgages using the base rate (such as COFI, COSI, prime rate, T-bill rate, LIBOR, etc.) and the mark-up, both provided in the LPS data. Observations with missing base-rate type are deleted. If the markup is missing, the observation is deleted unless the loan went through at least one rate reset and the markup can be deduced from the latest rate and the base rate. Forward-looking base rates are assumed to remain constant at their last actual rate. In other words, all mortgage rates are treated as fixed going forward.

After accounting for all the missing data, there are 258,656 observations in the estimation sample and 517,311 observations in the prediction sample.

Determining the default and prepayment paths of the loans in the prediction sample is the first stage of the analysis. The second stage is estimating the costs associated with the subsidies. The direct costs of interest subsidies and down-payment assistance are straightforward to calculate, given that the loan characteristics and the number of borrowers are known. The challenge is the estimation of the subsidies' effect on loss in case of default. For that purpose, home values at default could be calculated using the appraisal value at origination, modified by the appreciation/depreciation rate of the Case-Shiller Home Price Index during the life of the loan in the state where the property is located. Moreover, the price received by the lender when the property is sold may be discounted by an additional 25 percent because the property is real-estate-owned, and it takes a long time to sell a property in a down market (Pennington-Cross, 2006, Campbell et al., 2010). The difference between the discounted price and the outstanding loan amount is the gain/loss to the lender. Unfortunately, this strategy confirms that the housing bubble masked potential losses from default, as one might expect. For example, there would have been no losses to lenders from mortgages defaulting in 2006, in the sense that home values were greater than the amount owed in almost all defaulting loans. To undo the effect of the housing bubble, I take the average state-level monthly appreciation rate in the 1980–2001 period and assume that this rate remains constant over time.

There are also many effects of the crisis that I cannot disentangle from the mortgage performance. For example, interest rates declined to historically low levels following the severe recession, and adjustable-rate-mortgage borrowers benefited from the lower rates. What the rates would have been in the absence of the crisis is not an issue I deal with in this paper.

As a final note, recall that the simulations are based on 517,311 loans totaling $54 billion. This is a miniscule number relative to the overall size of the market. The total size of the market (as reported by LPS Applied Analytics), including all loans with missing information, is $290.5 billion. Furthermore, the LPS data captures only about one-third of the actual loans originated. For example, it reports $114 billion in purchase loans originated in the second quarter of 2003 (including loans of all sizes in the entire country). In comparison, the Mortgage Bankers Association reports $344 billion in purchase originations over in that same quarter. To capture the total market size, I assume that the loans missing from the sample are similar to those in the sample, and augment my cost and loss calculations by a factor of 22. All costs reported in the next section are the augmented numbers. The dollar amounts are in *present values,* assuming a 3.4 percent discount rate, which is the yield on a 20-year Treasury bond, that is, the government's funding rate.

III. Results

Table 3 shows the coefficient estimates for the default and prepayment models, where the sign of the coefficient indicates the impact on survival probability. The coefficients of the default model have the expected sign. Higher interest rates, higher loan amounts (keeping appraisal value constant), lower FICO scores, adjustable interest rates, interest-only loans, lack of full documentation, and lower appraisal values are associated with lower survival rates. Similarly, prepayments are more likely if interest rates are high or variable, FICO scores are low, loan amount and debt-to-income ratios are high, and the loan is fully documented. Negative amortization loans, interest-only loans, and loans with prepayment penalties are less likely to prepay.

Because the ultimate motive of supplemental down payments and interest subsidies is assumed to be the creation of sustainable homeownership, cost comparisons should be made after insuring that the outcomes are equivalent in terms of sustainability. In other words, long-term default outcomes must be the same. By equating the predicted December 2017 default rates in the interest- and down-payment-assisted pools, I find that a 1 percent interest-rate subsidy is equivalent to a $3,200 supplement to down payments. Figure 1 shows the cumulative default pattern of both pools. The 180-month cumulative default rate is 10.7 percent in the subsidized pools, compared to 11.5 percent in the unsubsidized pool. The change in default rate represents

83,374 households switching from default to successful homeownership. The next step is to calculate how much it costs to reduce defaults by 0.8 percentage points.

The supplemental down payment required is the number of originations times the necessary amount per borrower, $3,200, which adds up to $34.2 billion over three years (figure 2). The cost of the interest-rate subsidy depends on how long the subsidized loans survive before being prepaid or going into default.[5] Based on the prepayment and default paths generated by the simulations (figures 3 and 1), the cost of the interest-rate subsidy is estimated to be $44.9 billion over 15 years (figure 4). Note that the two types of subsidy will also differ in the loss suffered in the event of default. Because the loan amounts are smaller, down-payment-assisted loans will have higher equity at the time of default. The loan amounts at default come from the simulations. Figure 5 shows the loss profiles in the subsidized samples. Losses in the interest-subsidy sample reach $4.5 billion, whereas the losses in the down-payment-assisted sample add up to $3.8 billion. Both compare favorably to losses of $5.5 billion that would occur in the absence of any assistance. I subtract the loss savings from the gross cost of the assistance programs and calculate the net costs to be $43.8 billion and $32.5 billion for the interest-subsidy- and down-payment-assistance programs, respectively.

At this point, down-payment assistance seems like the lower-cost program. However, in addition to reducing defaults, the subsidies also incentivize renters to buy their homes. Using the estimates of Linneman et al. (1997), a 1-percent interest-rate subsidy creates a 0.07-percent increase in the homeownership rate, which translates to 73,836 new homeowners. The $3,200 down-payment assistance reduces the average loan-to-value ratio by 3.1 percent and creates a 0.51-percent increase in homeownership rate or 541,627 new buyers. Assuming that the default and prepayment profiles, as well as the loss rates, for these new buyers will be identical to those for existing borrowers, the new buyers use up $297 million in interest subsidies or $1.6 billion in down-payment assistance. The total cost of the interest-subsidy program hits $44.1 billion and that of the down-payment-assistance program reaches $34 billion. Despite the large addition of new buyers, the down-payment program still needs 23 percent less resources. Table 4 summarizes these calculations.

[5] The interest subsidy ends if the borrower refinances. It is assumed not to transfer to the new loan.

IV. Policy Implications

Two policy issues arise from this analysis. The first is whether or not we want to spend roughly $34 billion–$44 billion to increase sustainability (or reduce defaults) by 0.8 percent. Assuming that this question is answered in the affirmative, the second issue is the funding options for the subsidies. As mentioned earlier, interest subsidies are currently funded through tax expenditures, but programs for down-payment assistance are funded through a mixture of public and private resources. I will assume that this structure will continue. In other words, interest-rate subsidies will continue to be paid entirely with tax money, while down-payment subsidies can be enhanced through private contributions. This is a sensible assumption, given the voluntary nature of private contributions. Interest-rate subsidies are disbursed over the life of the mortgage (although few mortgages are still alive after 15 years). Any private source would have trouble committing itself for such an extended period.

One complication of down-payment assistance is that it adds to the homebuyer's equity, so it could potentially be borrowed against by the homebuyer and spent on consumption instead of being a source of stability. There are ways to get around this problem—for example, by granting the assistance program a silent second lien on the property that is "talkative" enough to warn off home-equity-line-of-credit lenders but expires automatically if the homeowner stays in the house for a previously specified period.

It is also worth noting that the down-payment supplement of $3,200 does not have to be entirely in "assistance" form. There are promising savings programs targeting LMI households such as individual development accounts (IDAs). These are savings accounts established with local financial institutions and managed by community organizations in the name of an LMI individual in order to encourage saving toward starting a business, paying for education or job training, or buying a home. IDA programs typically provide $1 to $3 in matching funds for every dollar saved by an individual participant. The matching funds come from public and private sources; the federal Assets for Independence program requires IDA sponsors to raise private funds to match the federal money. The match comes with some strings attached. For example, participants must save for a minimum length of time before they can withdraw their savings without losing the matching funds. They must also get training in financial literacy before they can use the money. More information about account features, participant characteristics, and findings from pilot programs can be found in Schreiner and Sherraden (2007).

There is some evidence that IDAs encourage new savings, but the existing experimental designs are too weak to prove that the saving rate does indeed increase. Schreiner and Sherraden report that IDA participants in the American Dream Demonstration pilot program saved *on average* $558 over the life of the program (varied regionally, with a maximum of 4.5 years); this comes to a little more than $1,000 if matching *private* funds are included. But the authors also recognize that it is not clear how much of those savings came from the cannibalization of other savings accounts, such as retirement accounts.

Still, if the numbers are reliable in terms of the actual additional savings they can create, such a savings program could potentially shave $11 billion (11 million borrowers at $1,000 each) from the cost of the down-payment program.

V. Caveats

This paper's findings come with many warnings attached. First, as mentioned earlier, the housing boom and bust most likely reduced the occurrence of defaults—as well as the severity of losses in default—and increased the occurrence of prepayments. Even though my analysis left out most of the home price boom and bust, their impact will still be felt indirectly through the path followed by mortgage rates, for example. Therefore, the loss estimates should be interpreted with caution.

Second, program costs can be significantly reduced by limiting the subsidies to first-time homebuyers. People who managed to buy their first home can most likely buy their next without assistance. However, first-time-buyer information is not available in the dataset, so alternative cost analysis is not available.

Third, forecasting the default and prepayment paths of mortgages 15 years into the future, using three years' worth of observed data, can be a stretch. Yet the choice is unavoidable, given the data problems described earlier.

Finally, unlike down-payment assistance, which is disbursed at the time of purchase, the interest-rate subsidy is disbursed over the life of the loan. Consequently, its present value is very sensitive to the choice of discount rate. Recall that the $44.1 billion cost given in table 4 is calculated using a 3.4-percent discount rate. At 4.4 percent, the cost drops to $42 billion.

VI. Conclusion

There is clear evidence that many low-to-moderate-income homebuyers are wealth-constrained; therefore, a dollar spent in down-payment subsidies is more successful at creating new homebuyers than a dollar spent in interest-rate subsidies. However, the recent crisis raised the important questions of whether these new homebuyers can actually remain homeowners in the long run and how much it costs to create successful new homeowners. This paper is an attempt at answering those questions.

I find that a dollar spent on interest-rate subsidies is not only less effective at encouraging homeownership than down-payment subsidies, but also less effective at reducing defaults. While the cost estimates of this paper can be improved upon with better data over time, the findings still suggest that down-payment programs have a pronounced edge over policies that target interest costs.

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Table 1 – List of Covariates

Variable	Definition
Int.Rate	The interest rate on the loan at origination
FICO	Borrower's FICO score at origination
IO	Interest-only loan indicator
Fixed	Fixed-rate loan indicator
Prepay	Prepayment penalty indicator
Negam	Negative amortization indicator
Full.Doc	Fully documented loan indicator
LogAppraisal	Natural log of the appraisal value
DTI.Ratio	Borrower's debt-to-income ratio at origination
Term	The term of the loan
Single.Fam	Single family home indicator
LogOrig	Natural log of the loan amount at origination
Convent	Conventional loan indicator
Appreciate	Home price appreciation in the state in 1980–2000
LogIncome	Median income of the zip code in 2000
35 MONTH DUMMIES	A dummy that equals one in the month the loan was originated
51 STATE DUMMIES	A dummy for each state where loans were originated

Table 2 – Summary Statistics (Selected Variables) (775,968 observations)

Variable	Mean	Std Dev	Median	Minimum	Maximum
Int.Rate	6.09	0.94	6	1	16.13
FICO	689	69	691	300	966
Appreciate	1.48	0.54	1.36	0.57	3.93
IO	0.02	0.15	0	0	1
Fixed	0.81	0.39	1	0	1
Prepay	0.13	0.33	0	0	1
Negam	0.04	0.20	0	0	1
LTV	86.24	13.35	89.89	0.01	192.28
Full.Doc	0.72	0.45	1	0	1
Appraisal	122,775	40,789	123,000	3,000	211,700
LogAppraisal	11.65	0.38	11.72	8.01	12.26
DTI.Ratio	33.07	13.10	33	1	99
Term	29.02	3.70	30	0.5	80
Single.Fam	0.77	0.42	1	0	1
Orig	104,385	34,549	104,500	3000	172,632
LogOrig	11.49	0.39	11.56	8.01	12.06
Convent	0.67	0.47	1	0	1
Income	40,124	8,301	40,000	3,750	55,821
LogIncome	10.58	0.22	10.60	8.23	10.93

Table 3 – Hazard Regressions

	Default Model		Prepayment Model	
	Estimate	Chi-Sqr	Estimate	Chi-Sqr
Int.Rate	-0.112	278.3*	-0.068	1094.3*
FICO	0.006	2114.7*	0.001	392.7*
Appreciate	-0.223	1.1	2.519	2163.4*
IO	0.071	1.2	-0.072	45.8*
Fixed	0.185	78.5*	0.229	2072.9*
Prepay	0.057	2.2	-0.012	1.1
Negam	-0.752	217.7*	-0.057	18.9*
Full.Doc	-0.095	37.8*	0.079	467.1*
LogAppraisal	1.559	454.9*	-0.023	4.4
DTI.Ratio	-0.003	34.7*	-0.002	168.4*
Term	-0.006	3.6	-0.001	4.1
Single.Fam	-0.045	6.4	0.010	6.5
LogOrig	-1.492	411.9*	-0.120	119.4*
Convent	0.006	0.1	-0.040	87.4*
LogIncome	0.234	54.2*	-0.042	26.5*
State and origination month dummies	Included		Included	
Mill's Ratio	Included		Included	
σ	0.93		0.61	
δ	0.40		0.14	

No intercept.

* Significant at 1 percent.

Table 4 – Summary of Results

All dollar figures are in billions.

	Total Subsidy to Borrowers	Gain from Lower Loss Given Default	Net Cost of Borrowers	New Buyers	Cost of New Buyers	Total Net Cost
Interest Subsidy	[ii] **$44.882**	[iii] **$1.070**	[vi]: [ii] - [iii] **$43.812**	[viii] **73,836**	[x]: [viii] * [ii]/[i] **$0.297**	[xii]: [vi] + [x] **$44.109**
Down payment Subsidy	[iv] **$34.184**	[v] **$1.731**	[vii]: [iv] - [v] **$32.453**	[ix] **541,627**	[xi] : [ix] * [iv]/[i] **$1.536**	[xiii]: [vii] + [xi] **$34.026**

Number of Originations [i]	**11,176,728**
Predicted Defaults **without** Subsidy	**1,279,814**
Predicted Defaults **with** Subsidy	**1,196,440**

[viii]: An increase of 0.07 percent in the homeownership rate based on the 2000 Census. 0.07 percent is the change in expected homeownership rate from a 1 percent decline in mortgage rates (Linneman et al., 1997).

[ix]: $3,200 in additional funds increases the down-payment rate by 3.06 percent. This down-payment relief should increase the homeownership rate by about 0.51 percent or 541,627 households based on 2000 Census data.

[x]&[xi]: New buyers are assumed to be similar to existing buyers in every respect except the down-payment constraint.

Figure 1 – Estimated cumulative default rates of original and subsidized loans

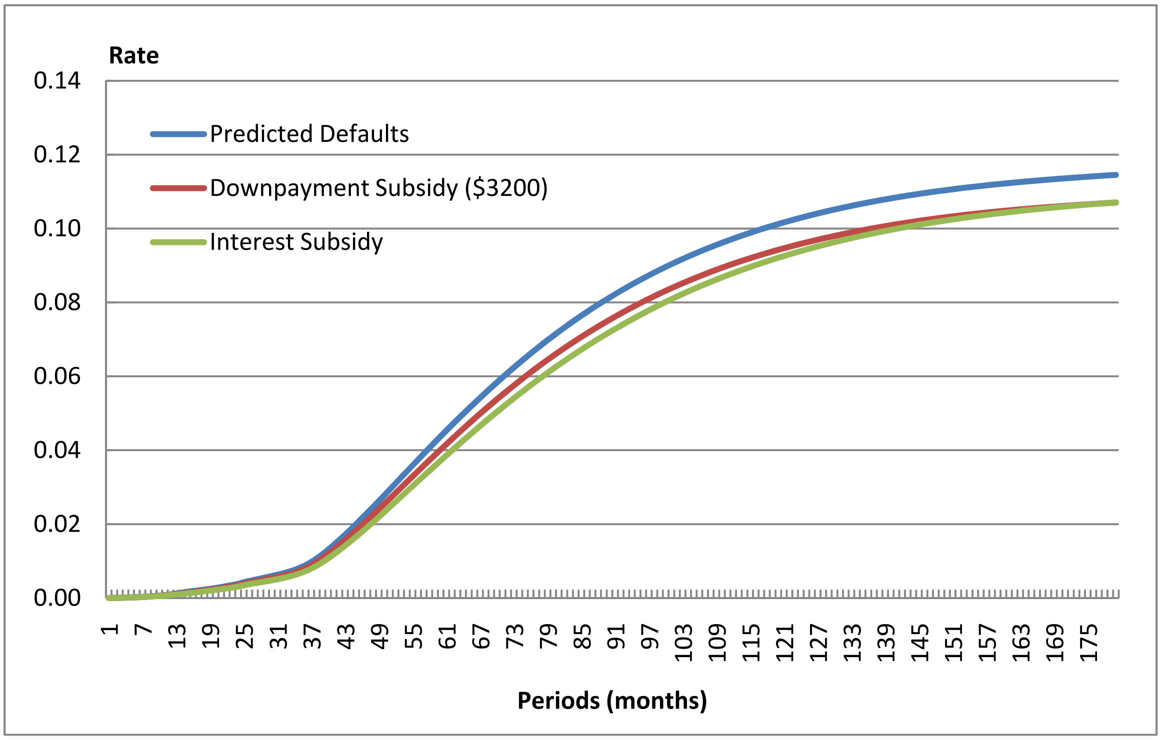


Figure 2 – Monthly cost of down-payment subsidies

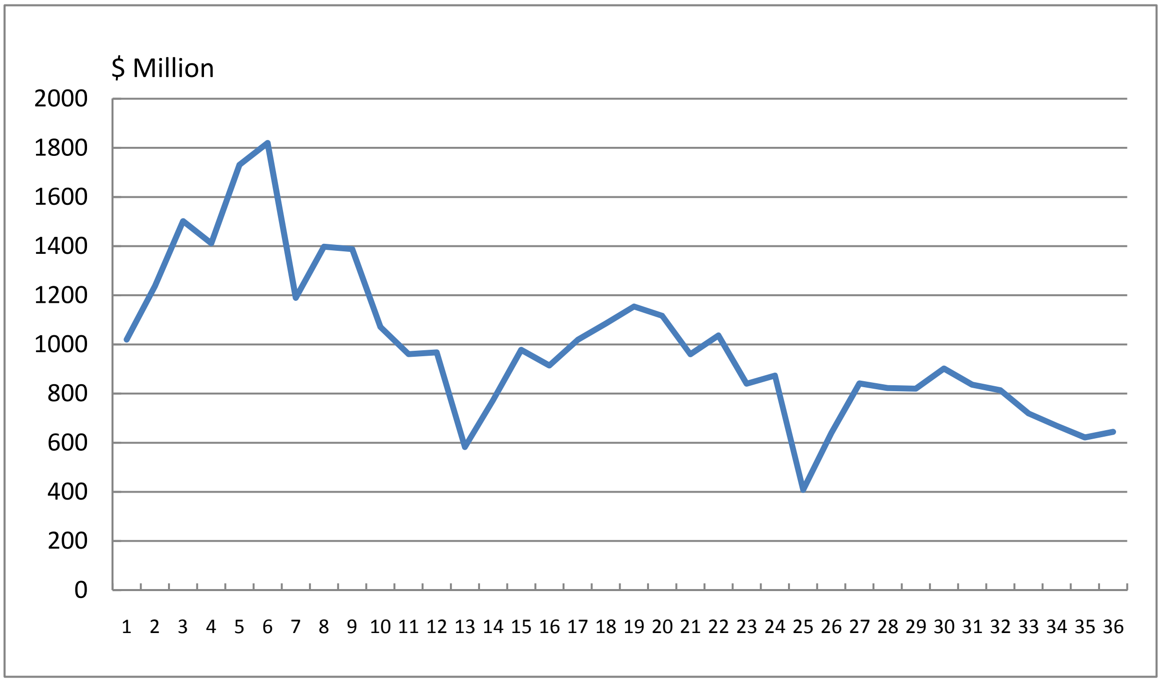


Figure 3 – Estimated cumulative prepayment rates of original and subsidized loans

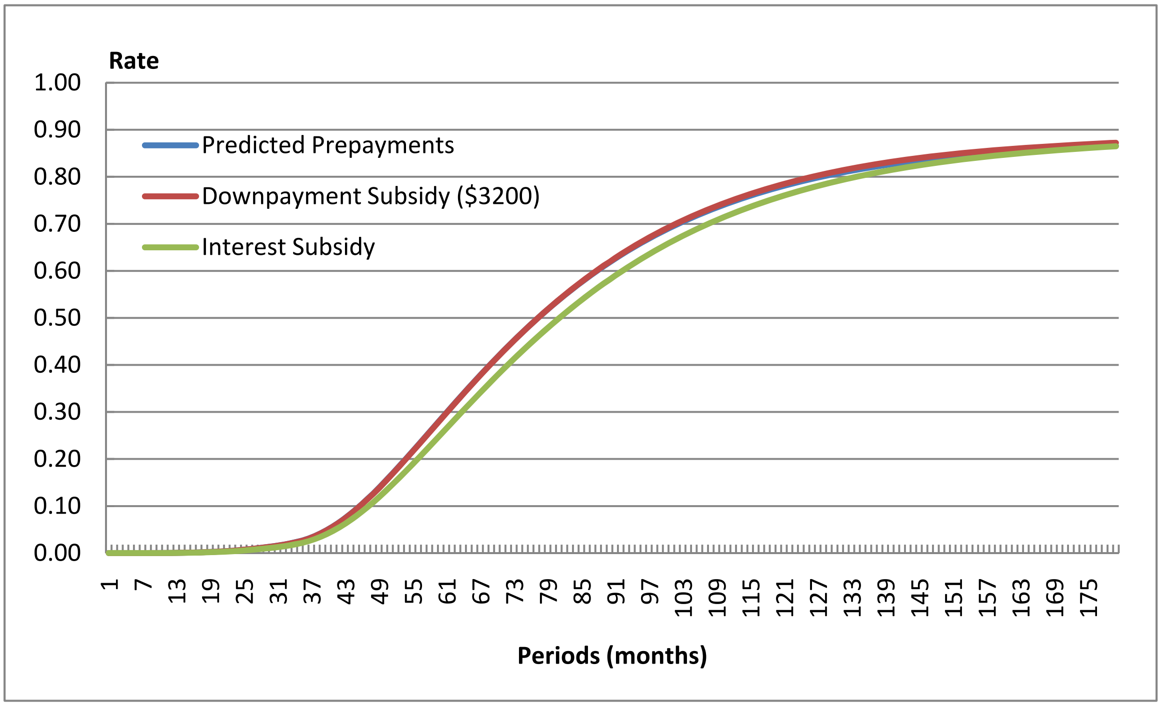


Figure 4 – Monthly cost of interest-rate subsidies

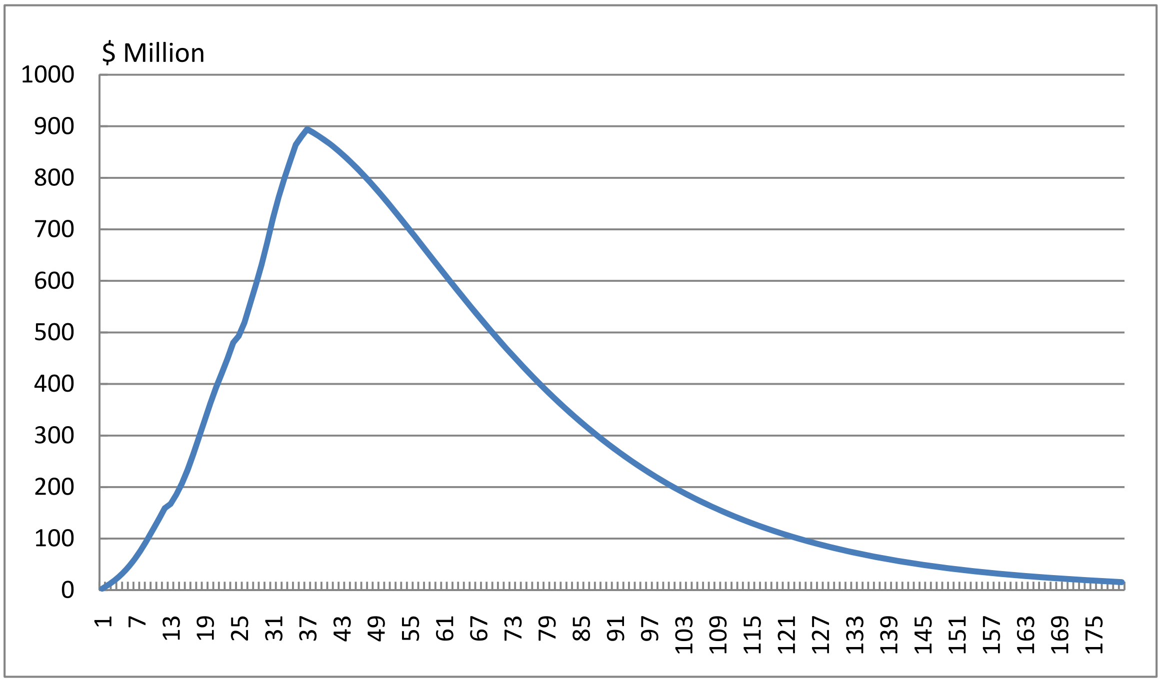
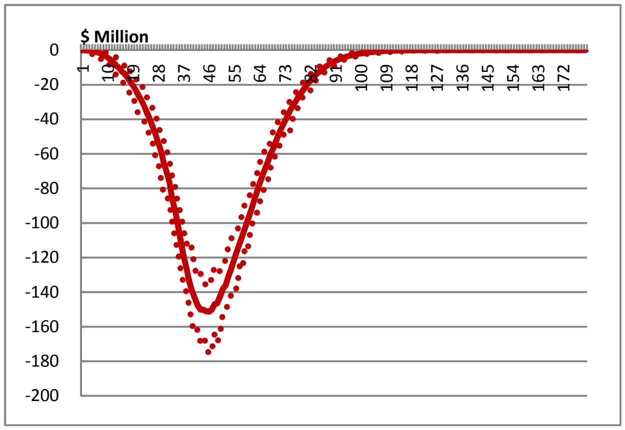
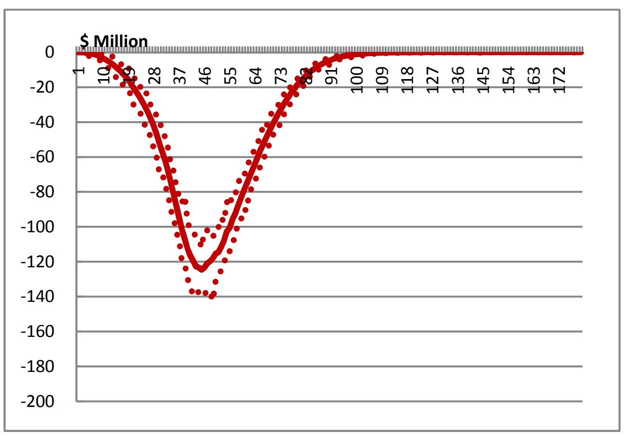
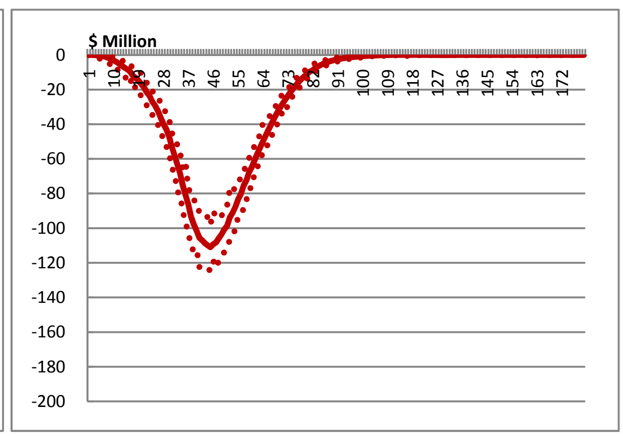


Figure 5 – Expected lender losses in foreclosure (present value)



a. No Subsidy





The dashed lines indicate the minimum and maximum losses in each period.

b. Interest-rate Subsidy **c. Down-payment Subsidy**