

# Post-purchase Counseling and Default Resolutions among Low- and Moderate-Income Borrowers

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**Abstract**                      The rise of delinquencies and foreclosures in a softening housing market calls for systematic studies of default behavior and efforts to minimize the default risks. Using a sample of residential mortgages made to low- to moderate-income borrowers, this paper empirically examines the impact of a proactive post-purchase counseling service on moderately delinquent mortgages. It demonstrates that well-timed, situation-appropriate counseling, even over the phone, effectively increases the curing probability of delinquent borrowers. The findings hold even after accounting for unobserved heterogeneity among borrowers and the endogeneity problem. Many other factors, such as home equity, local economic conditions, and borrower and loan characteristics, also impact the transition of delinquencies.

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With the elevated levels of delinquency and foreclosure in recent years,<sup>1</sup> foreclosure prevention efforts, particularly post-purchase counseling programs, have drawn the attention of researchers, practitioners, and policy makers (see review in Quercia, Gorham, and Rohe, 2006). This issue is particularly important in the low- to moderate-income (LMI) market since low-income borrowers are usually associated with a higher risk of mortgage default (Van Order, Firestone, and Zorn, 2007). Because LMI borrowers typically have less financial reserves, smaller equity cushions, and higher debt-to-income ratios, default and foreclosure become real possibilities for them when unexpected financial shocks create either short- or long-term insolvency problems. Furthermore, once these borrowers fall behind, they usually do not have enough reserves to recover quickly. So a better understanding of default risks and efforts to minimize the foreclosure rates for borrowers already in delinquency is crucial to helping them keep their homes in the current softening market, where delinquency and foreclosure rates are historically high.

A number of studies have investigated loan termination outcomes and losses for conventional, FHA, and subprime loans (e.g., Crawford and Rosenblatt, 1995;

Ambrose and Capone, 1998; Capone and Metz, 2003; Philips and VanderHoff, 2004; Cutts and Green, 2005; Capozza and Thomson, 2006; and Pennington-Cross, 2006a, 2006b). However, most studies are limited in the variety of options that delinquent borrowers hold and the factors that may impact loan terminations. In particular, most foreclosure studies have focused on the borrower's option to default, with little attention to foreclosure prevention or loss mitigation efforts by servicers. In fact, the mortgage servicing industry has experienced dramatic changes and has made many innovations in programs and policies that help homeowners retain their homes (Cutts and Green, 2005). The proliferation of credit scoring tools also enables servicers to identify risky borrowers and employ strategies to prevent early delinquent borrowers from falling further behind. For seriously delinquent borrowers, servicers or third-party agencies may offer intensive counseling services, helping borrowers evaluate their financial conditions and offering home retention workout plans or other alternatives to foreclosure. Many mechanisms and programs are in place to manage and minimize default and foreclosure risk, and some strategies may be more cost-effective than others.

Post-purchase homeownership counseling and education have been considered as important mechanisms in foreclosure prevention efforts; however, there has been little convincing empirical evidence to support this view. There has been some evidence that pre-purchase counseling can offset the default risk, as lenders relaxed underwriting standards in their affordable housing lending (Hornburg, 2004). Although lenders, community-based organizations, and government agencies established an increasing number of post-purchase counseling programs due to a rising tide of foreclosure (Reid, 2006), post-purchase counseling programs are still fewer in number and less extensive than pre-purchase programs. Furthermore, evaluating the effectiveness of post-purchase counseling or foreclosure-prevention programs has been difficult because of data scarcity, lack of a standard definition of success, and the ethical and practical complications of finding control groups (Quercia, Cowan, and Moreno, 2008).

Stegman, Quercia, Ratcliffe, Ding, and Davis (2007) test several preventive servicing-related propositions in the transition from early delinquency (30-day) to default (90-day), using a group of mortgage loans serving LMI borrowers. They find that the key indicators of default risk at the time of underwriting [e.g., credit score and loan-to-value (LTV) ratio] are generally insignificant in predicting whether an already delinquent loan will default. Most importantly, they find that the likelihood that a delinquent mortgagor will ultimately default varies significantly across loan servicers, even after controlling for loan and borrower characteristics. However, their study does not investigate the specific role of loan servicers in the transition from default to foreclosure.

To fill the gap in the early literature and to extend the work of Stegman, Quercia, Ratcliffe, Ding, and Davis (2007), this study empirically examines the impact of a proactive delinquency counseling practice on the outcomes of moderate delinquencies. This analysis contributes to the existing literature in several ways. First, the study focuses on a group of home purchase loans that serve LMI

borrowers. It is still unclear whether the delinquent loans serving the LMI population behave differently over time than ordinary prime loans, FHA loans, or subprime loans. Second, the study uses a rich dataset that includes borrower and loan information at origination and a complete monthly payment history for each individual loan. Finally, since there are data on certain servicer-initiated practices, such as post-purchase counseling for delinquent borrowers and loan modifications, these practices are considered in the analysis. This is also an important contribution, as the servicing side of the affordable housing system becomes more critical than ever with the proliferation of affordable lending products.

The findings reveal that most moderate delinquencies do not end in foreclosure. A delinquent borrower can either remain delinquent for some time or eventually exit delinquency through curing, prepayment, loan modification, or foreclosure. The results demonstrate that timely delinquency counseling is effective in increasing the curing probability of LMI delinquent borrowers. This finding holds even after accounting for unobserved heterogeneity among borrowers and the endogeneity problem related to counseling. The success of counseling appears to depend on timing, and only counseling that addresses an active delinquency situation is effective. These findings suggest that well-timed, situation-appropriate counseling, even over the phone, effectively and efficiently increases the probability of curing delinquencies. Many other factors, such as home equity, local economic conditions, and borrower and loan characteristics, also impact the transition of delinquencies.

The next section reviews recent literature on the delinquency transition and counseling. The third section describes data and methodology. Empirical results are in the fourth section, followed by conclusions.

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## Literature Review

Early literature on loan performance generally considers foreclosure a one-step decision for borrowers and limits borrowers' options to either losing the home (foreclosure), paying off the mortgage (prepayment), or remaining active (Quercia and Stegman, 1992). However, recent studies have started to recognize that mortgage default and foreclosure are two separate events, and that foreclosure is only one possible outcome of a delinquency episode (e.g., Ambrose and Capone, 1998). In this framework, a borrower first decides technically to default on the mortgage by not making a scheduled mortgage payment or by not paying in full. This may result from a decision to exercise the put option or from a temporary financial crisis that causes the borrower to delay mortgage payments to finance other expenditures. Delinquent borrowers in fact have a set of alternative options, such as paying off the mortgage by refinancing or selling the property, or some other solution that allows the borrower to retain the home and reinstate the mortgage over time. When a borrower is no longer able to afford the mortgage and a regular sale would be too costly, voluntary title transfer serves as another option.

Several recent studies identify specific factors that affect whether defaulted loans will go through to foreclosure. Studies that use data on conventional or FHA mortgages identify that home equity level, borrower characteristics, local economic and housing market conditions, and state foreclosure laws affect default resolution probabilities (Ambrose and Capone, 1998; Capone and Metz, 2003; and Philips and VanderHoff, 2004). In the subprime market, Capozza and Thomson (2006) and Pennington-Cross (2006b) find some evidence that delinquent subprime loans are more likely to become real estate owned (REO) than other loan products but usually take much longer to get there. They find that lenders are more likely to be tolerant when the delinquent borrower has made some payments, when the payment-to-income ratio is high, when general economic conditions are favorable, or when the interest rate premium is high.

Some recent efforts have examined the impact of a variety of mechanisms on foreclosure prevention and loss mitigation. For example, Cutts and Green (2005) provide an excellent review of the servicing literature and innovations in loan servicing and loss mitigation technology. They use Cox's hazard model to investigate the impact of repayment plans on foreclosure incidence and loss mitigation, based on a large sample of Freddie Mac loans in different levels of delinquency. They find that borrowers who enter repayment plans have a much lower probability of home loss (80% lower for borrowers overall and 68% lower for LMI borrowers). For FHA loans, Capone and Metz (2003) find that the introduction of loss mitigation programs successfully lowered the foreclosure rate.

Research concerning homeownership education and counseling is less prevalent, although providing homeownership education and counseling services to delinquent borrowers has been considered an important tool in mitigating default and foreclosure risks. The roots of the post-purchase services industry go back to the 1960s, when the Housing and Urban Development Act of 1968 allowed the Department of Housing and Urban Development (HUD) to authorize counselors to provide counseling to homeowners in the Section 235 low-income homeownership program (Quercia, Gorham, and Rohe, 2006). Counseling agencies focused mainly on foreclosure prevention for almost two decades, primarily because of high foreclosure rates among HUD's homeownership programs.

In the 1990s, however, when efforts were made to expand homeownership among LMI households, industry players shifted resources and attention toward pre-purchase counseling to offset default risk. The majority of the previous empirical studies have focused on the impact of pre-purchase homeownership counseling on loan performance; empirical studies on post-purchase counseling are scarce. In his review article, Hornburg (2004) indicates that there are some credible and substantiated research findings about the impact of pre-purchase homeownership counseling on loan performance. For example, Hirad and Zorn (2002) provide the first empirical analysis of the impact of pre-purchase counseling on delinquency and conclude that pre-purchase counseling can effectively reduce default risk (90-day). Additionally, Hartarska and Gonzalez-Vega (2005) provide evidence that credit counseling reduces the incidence of default.

Only a few recent studies empirically examine foreclosure prevention counseling programs provided by community-based agencies. Quercia, Cowan, and Moreno (2008) find that community-based foreclosure prevention services provided by the Mortgage Foreclosure Prevention Program are cost-effective in terms of two measures: time-to-resolution and recidivism. They find that delinquent borrowers who received both pre-purchase counseling and post-purchase foreclosure services are more likely to keep their homes and resolve their delinquency quicker, and are less likely to experience delinquency within three years after the delinquency intervention. Collins (2007) focuses on borrowers' perceptions and assessments of counseling based on survey data. The results suggest that borrowers who receive more hours of counseling perceive counseling more favorably than those who receive less counseling. Borrowers who receive more intensive counseling are also less likely to lose their homes in foreclosure. Generally, existing empirical studies on post-purchase counseling suggest a positive impact of post-purchase counseling, but the results are far from conclusive since the studies suffer from data problems, the lack of standard measures of the benefits of counseling, and the difficulties in finding control groups.

This study combines and extends these two related strains of research: one concerning the delinquency transition and the second concerning the impact of homeownership education and counseling. With an awareness that counseling programs vary by their method of delivery, desired outcomes, counselor characteristics, and program content, this research contributes to the literature by focusing on the impact of an early proactive counseling service. Servicers' main approach since the early 1990s has been to activate personal contact for assistance at 90-days delinquency; usually servicers consider intervention prior to 90 days too costly because of the high rate of borrower self cures. However, an early proactive intervention may be crucial for some delinquent borrowers, who may need advice to help them overcome short-term difficulties or find alternatives to foreclosure. Indeed, when a delinquency becomes very serious and a legal notice of foreclosure has been issued, it is sometimes impossible for a servicer to intervene successfully. For this reason, Freddie Mac recently announced that it will instruct its servicers to become more involved after 60-days delinquency rather than waiting until 90-days delinquency.<sup>2</sup> The current study empirically analyzes the effects of one early proactive intervention on the transition of moderately delinquent loans.

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## Data and Methodology

The data for this study come primarily from a subset of home purchase loans originated by a group of lenders under the Self-Help Ventures Fund's Community Advantage Program (CAP), also known as the Self-Help Secondary Market Program. Many nonconforming loans are held in lenders' portfolios because most of them meet neither the underwriting guidelines used by secondary mortgage market institutions in their standard of affordable loan purchases nor the

underwriting guidelines for FHA loans. However, under the CAP program, participating lenders are able to sell these nonconforming mortgages to Self-Help, which then securitizes and sells them to Fannie Mae and other investors. CAP loans are characterized by flexible underwriting that usually requires little or no downpayment, high debt burdens, nontraditional proofs of creditworthiness, and sometimes no requirement for mortgage insurance. CAP borrowers are either low-income borrowers or LMI minority borrowers, or LMI borrowers in low-income or minority neighborhoods.<sup>3</sup>

This study uses a subset of 25,725 CAP loans originated from 1998 to 2004 (Exhibit 1). All CAP loans in this sample are fixed-rate home purchase loans, 99% of which have a 30-year amortization period. The loans do not feature prepayment penalties or balloons. The average note rate is 7.2% and the average loan amount is about \$90,000. Loans in this sample are characterized by a high original LTV ratio: over 76% of the loans have an original LTV of 95% or higher, and with over 67% at 97% LTV or higher. This sample of CAP borrowers is also characterized by low credit scores and low household income; about 42% of borrowers have an origination credit score of less than 660 or have no credit score at all. The mean household income at origination was about \$33,000, and the mean backend ratio was 36%. About 47% are minority borrowers. National in scope, this sample of CAP loans originated in 49 states, with 22% of the loans originating in North Carolina.

Exhibit 2 shows the worst delinquencies for loans that originated between January 1998 and December 2004. During the study period (January 2003 to September 2006), most CAP loans (77%) in the sample did not experience delinquency. But many CAP borrowers have experienced different levels of delinquencies. About 11% of the sample had at least one 60+ day delinquency and almost 8% had at least one 90+ day delinquency. Generally, the performance numbers of the sample during the study period reflect the performance of the whole pool of loans, though some loans were terminated before 2003.

To prevent early delinquencies from falling further behind and to reduce the rate of foreclosure among serious delinquencies, Self-Help suggests a specific servicing timeline for its subservicers to follow through a delinquency process. According to Self-Help, its primary goal in servicing is to help borrowers stay in their homes. As a nonprofit organization, Self-Help's philosophy differs from the traditional industry strategy in both flexibility and timing. Self-Help is more comfortable allowing borrowers more time to recover from a hardship, and it instructs servicers to do whatever they can to avoid foreclosure. Of course, as indicated in Stegman, Quercia, Ratcliffe, Ding, and Davis (2007), servicers may differ in their actual delinquency management processes.

### *The Proactive Counseling Program*

Since late 2002, Self-Help has been working with Consumer Credit Counseling Services (CCCS) of San Francisco to provide counseling to moderately delinquent

**Exhibit 1** | Descriptive Statistics of Origination Information for CAP Loans

Variable	Percent	Mean
<b>Credit Score</b>		
No Credit Score or missing	8.51%	
FICO < 620	13.42%	
FICO 620–659	20.40%	
FICO 660–719	30.12%	
FICO ≥ 720	27.55%	
<b>Loan Characteristics</b>		
LTV		93.30%
Backend ratio		36.25%
Origination amount		\$89,903
Note rate		7.16%
<b>Borrower Characteristics</b>		
Female	44.10%	
African-American	19.22%	
Hispanic	21.32%	
First-time homebuyer	41.04%	
Income at origination		\$33,268
<b>Geography</b>		
Non-metropolitan location	18.08%	
NC	21.64%	
CA	14.86%	
OK	8.77%	
FL	7.28%	
OH	7.25%	
Other states	40.20%	
<b>Origination Year</b>		
1998	9.27%	
1999	8.59%	
2000	13.77%	
2001	23.73%	
2002	18.78%	
2003	12.91%	
2004	12.96%	

*Notes:* The number of loans is 25,725. The loans originated between January 1, 1998, and December 31, 2004. The sources are Self-Help Community Advantage and authors' calculations. This sample only includes the loans that were still active as of January 1, 2003, or later. Sample size may differ for different variables because of missing data.

**Exhibit 2** | Worst Delinquencies

	From Origination (01/98–09/06)		During Study Period (01/03–09/06)	
	# of Loans	Percent	# of Loans	Percent
Never Delinquent	22,158	75.7%	19,846	77.2%
30+ Days	7,123	24.3%	5,879	22.9%
60+ Days	3,498	11.9%	2,835	11.0%
90+ Days Delinquent	2,535	8.7%	2,027	7.9%
120+ Days Delinquent	2,044	7.0%	1,599	6.2%
Total	29,281 <sup>a</sup>		25,725	

*Note:* Loans originated between January 1, 1998 and December 31, 2004 only; from Self-Help and authors' calculations.

<sup>a</sup>This sample size is larger because it includes loans that were terminated through prepayment or foreclosure between January 1, 1998 and January 1, 2003.

homeowners. Borrowers from selected servicers (six servicers as of July 2006) who were 45-days delinquent were referred for delinquency counseling offered by CCCS. Referred delinquent homeowners receive an introductory letter from the servicer notifying them that they will receive a telephone call from CCCS to discuss their situation. To avoid any negative connotations associated with budget or credit counseling, the program is referred to as a “housing education program” in partnership with the borrower’s servicer. CCCS is allowed to make up to three attempts to contact the borrower within 30 days after the referral. Homeowners are given financial and budget counseling over the telephone if they can be reached. We know the exact date and result of each contact. Homeowners with loans managed by other servicers did not have the opportunity to receive this counseling service. Overall, the participating servicers were handling 22% of all loans in this sample but served 43% of all 60-day delinquencies. This is not surprising, because Self-Help deliberately sought to provide delinquency counseling to portfolios with poorer performance.

The result of a contact may be:

1. Borrower not reached (none);
2. Contact, with brief introduction of counseling services (contact);
3. Longer conversation to help the borrower assess financial information, and tips on budgeting and debt management to avoid delinquency (counsel); or
4. In-depth assessment, usually for an hour, of the borrower’s financial condition and options, and creation of a plan of action to get the borrower current (counsel).

The different levels of treatment were coded, with treatment 1 being “none” because the servicer could not contact the borrower and the borrower received no counseling service. Treatment 2 is “contact,” as there was only a brief conversation and no counseling. Treatments 3 and 4 are very similar and are considered as “counsel.” A telephone counseling session usually takes about an hour.

Self-Help records reveal that 1,435 loans were referred through July 1, 2006. About 22% of the referred loans were “contact” only and 33% received counseling service. Some borrowers were contacted by the counseling agency several times, usually because they experienced multiple 45-day delinquencies. Because of serial referrals and different servicer practices, many borrowers were contacted at some point other than 45-day delinquency.<sup>4</sup> In fact, 21% of the referred loans never reached 60-day delinquency.

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### Sample Selection and Modeling

This analysis focuses on what happens to moderately delinquent loans (60-day). Loan payment history data was used to identify when a loan was 60-days delinquent and how long it stayed delinquent, which generated a “delinquency spell.” The delinquency spell started from the first month that the loan was identified as delinquent (60-day) during the study period and ended either the day the delinquency was resolved (terminated or cured) or at the end of the study period, whichever came first. Once a delinquent loan was cured, any subsequent 60-day delinquency generated a new spell.

The study period from January 2003 to September 2006 was selected primarily for practical reasons. Self-Help did not develop its own servicing philosophy and strategies until late 2002.<sup>5</sup> For example, Self-Help did not approve any loan modifications before 2002 and did not initiate its proactive counseling program until late 2002. Those delinquencies that occurred before 2003 were excluded, generally because there was no opportunity for the delinquent borrowers to receive the counseling service. Loans that experienced their first 60-day delinquencies after 2005 were also excluded since they were too recent for observation of their final outcomes. After further excluding the loans that were returned to the original lenders because of the “limited indemnity” rule<sup>6</sup> and a few loans with missing data, the study sample consists of 2,975 60-day delinquency spells of 1,689 loans. About 57% of 60-day delinquent borrowers experienced only one 60-day delinquency during the study period, 24% experienced 60-day delinquencies twice, and the remaining 19% experienced three or more 60-day delinquencies.

Among the 2,975 60-day delinquent spells, 924 (31%) were referred for counseling, among whom 238 (26%) were contacted only, 350 (38%) received counseling services, and the rest (336, or 36%) could not be reached as of July 2006. Borrowers may receive counseling services before or after they are 60-days delinquent; 233 homeowners received counseling before the current 60-day delinquency and 183 during delinquency (Exhibit 3).

**Exhibit 3** | Delinquency Counseling and Outcomes (%)

	Total	Counseling before 60-day Delinquency Spell			Counseling during 60-day Delinquency Spell		
		None	Contact	Counsel	None	Contact	Counsel
Cured	65.5	65.5	65.4	65.2	64.9	67.9	72.1
Distressed PIF	7.3	8.1	2.2	2.2	7.7	3	4.4
Loan modification	3.2	3.3	1.7	2.6	3.4	2.4	0.6
Foreclosure	14.5	15.3	12.3	7.3	14.6	14.9	12
Delinquent	9.7	7.8	18.4	22.8	9.4	11.9	10.9
Total spells (#)	2,975	2,563	179	233	2,624	168	183

*Note:* From Self-Help and author's calculation; based on a group of 2,975 60-day delinquent spells of 1,689 CAP loans from January 1, 2003 to September 1, 2006.

Each delinquency spell could be resolved in one of the following ways:

- **Cured:** The outcome of a spell is coded as “cured” if the delinquency status becomes current according to the payment records. Loans that were prepaid when they were current or in 30-day delinquency are also considered “cured.”<sup>7</sup>
- **Delinquent:** An active loan is considered “delinquent” if it was both active and delinquent (30+ day) at the end of the study period.<sup>8</sup>
- **Prepaid** (or “distressed prepayment”): If a loan was prepaid when it was 60+ days delinquent, it is considered a “distressed prepayment.”<sup>9</sup>
- **Modified:** If the terms of a mortgage loan were permanently changed and were approved by Self-Help, the outcome of the loan is recorded as “modified.” A loan modification is treated in this study as a loan termination, even though a loan’s performance can be tracked after the modification.
- **Foreclosure:** This category includes both loans for which the lender took title through foreclosure and pre-foreclosure sales, as they also result in the borrowers losing their homes through title transfer.<sup>10</sup>

A multinomial logit (MNL) is used to model outcomes with multiple possible states. In each month the loan can be in only one state or outcome (cured, delinquent, prepaid, modified, or foreclosed). Since the sum of the probabilities of each outcome must equal one, the increase in the probability of one outcome necessitates a decrease in the probability of at least one competing outcome. Thus the multinomial logit model is a competing risk model. The probability of observing a particular loan outcome is given by:

$$\begin{aligned}
 \Pr(y_{it} = j) &= \frac{e^{\beta_j Z_{it} + \gamma_j C_{it}}}{1 + \sum_{k=1}^4 e^{\beta_k Z_{it} + \gamma_k C_{it}}} \text{ for } j = 1, 2, 3, 4 \\
 \Pr(y_{it} = j) &= \frac{1}{1 + \sum_{k=1}^4 e^{\beta_k Z_{it} + \gamma_k C_{it}}} \text{ for } j = 0, \\
 \ln L &= \sum_{t=1}^T \sum_{i=1}^N \sum_{j=0}^4 d_{ijt} \ln(\Pr(y_{it} = j))
 \end{aligned}
 \tag{1}$$

where  $j = 0, 1, 2, 3, 4$  represents the five possible outcomes of a delinquency spell and the omitted category ( $j = 0$ ) is foreclosure.  $d_{ijt}$  is an indicator variable taking the value 1 if outcome  $j$  occurs to loan  $i$  at time  $t$  and zero otherwise.  $Z$  contains a set of explanatory variables,  $\beta$  is the coefficient, and  $C$  contains the counseling variables. To control for the potential statistical problems associated with repeated events, the model was estimated using Stata's *mlogit* procedure with an adjustment to the standard errors for clustering by loan.

There are at least four issues affecting the determination of the study sample and the specifications of the model. The first is a sample selection issue. Data used for the analysis are conditional on the loans surviving up until the start of the study period, January 1, 2003 (for loans originated before 2003). As a result, delinquent loans that ended in foreclosure or were prepaid before 2003 are not included because the focus is on the time period of the study window. The strategy, therefore, for different study samples is first to check the descriptive statistics of the independent variables, which do not suggest very significant differences across the samples (Exhibit 4). A separate model is run for all the 60-day delinquencies (from origination to the end of study period) to determine whether there is any serious bias when focusing only on the delinquencies in the study period. However, the analysis suggests that the qualitative results are generally unchanged by using the smaller sample (Model 1 vs. Model 2 in Exhibit 6), so the results based on the study sample are reliable.

The second concern is the bias caused by the lender indemnity rules. Lenders are required to retain main recourse on the loan until 12 consecutive on-time payments are made. In other words, loans must survive with good payment history for a consecutive 12-month period. Otherwise, they are subject to being sent back to the original lenders. About 10% of the 60-day delinquent loans were lost because of this rule. This feature of the data may create additional selection bias; however, it may help the study to focus on the more normal delinquency and default cycle since it mainly excluded some early payment defaults, which are often thought to be associated with fraud. The selection of the study sample can also be interpreted as focusing on loans that generally performed well during the early stage after origination.

**Exhibit 4** | Descriptive Statistics

Variable	Full Sample		Study Sample		Participating Servicers		Description
	Mean	Std. rr.	Mean	Std. rr.	Mean	Std. rr.	
<i>call</i>	0.149	0.082	0.164	0.071	0.172	0.056	Call option: Saving from refinancing in the prime market
<i>put</i>	-0.284	0.204	-0.310	0.213	-0.306	0.167	Put option: (unpaid balance-house price)/ original price
<i>lupb</i>	11.075	0.406	11.065	0.397	11.033	0.348	Unpaid balance (in log)
<i>af_american</i>	0.418	0.493	0.429	0.495	0.592	0.491	African-American borrower
<i>delinq</i>	0.383	0.219	0.373	0.214	0.369	0.213	Share of observed months loan was delinquent prior to the 60-day delinquency
<i>loanage</i>	3.073	1.510	3.365	1.484	3.860	1.444	Loan age in years when delinquency starts
<i>dur</i>	9.062	9.634	10.177	10.331	10.833	10.431	Months after entering 60-day delinquency
<i>unemp_rate</i>	5.685	0.994	5.677	0.968	5.796	1.008	State unemployment rate
<i>hpi_a</i>	5.651	4.714	5.862	5.141	4.660	3.041	MSA <sup>a</sup> house price appreciation rate: appreciate rate relative to the same quarter in the previous year
<i>nc</i>	0.415	0.493	0.414	0.492	0.645	0.479	Property in North Carolina
<i>counsel_spell</i>			0.068	0.251	0.125	0.331	Counseling service during delinquency spell
<i>contact_spell</i>			0.059	0.236	0.110	0.313	Contacted only by servicer during delinquency spell
<i>counsel_bef</i>			0.076	0.265	0.141	0.348	Ever received counseling before the current delinquency spell
<i>contact_bef</i>			0.058	0.233	0.107	0.309	Ever contacted by servicer before the current delinquency spell

Notes: For the full sample,  $N = 30,043$  of 2,089 loans; for the study sample,  $N = 22,925$  of 1,689 loans; for the participating servicers,  $N = 12,385$  of 781 loans. The sources are Self-Help and authors' calculations.

<sup>a</sup>If the property is located outside an MSA, the state house price index is used.

Thirdly, there is the issue of unobserved heterogeneity among delinquent borrowers. It is impossible to obtain loan-specific parameters to measure the impact of unobserved or random forces impacting the outcome. Instead of assuming that the heterogeneity follows some distribution, this analysis follows a simplified approach employed in Pennington-Cross (2006b). As Equation (2) shows, a total of  $M$  groups can be identified that have higher or lower likelihoods of terminating the loan through different methods. Instead of observing to which group each loan belongs, this technique estimates a discrete probability distribution so that each heterogeneous group has a unique influence on the conditional probability estimate.  $p_m$  is the mass-point parameter representing the proportion of loans in the  $m^{th}$  group.<sup>11</sup> The location parameters,  $v_{jm}$ , reflect the idiosyncratic risk for risk  $j$  for the  $m^{th}$  unobserved heterogeneous group. Each group of loans is identified by a mass point, representing a distinct mass of loans. This analysis uses this technique to obtain estimates of the size of each mass point and the idiosyncratic shift in the probability estimates using maximum likelihood method. Model 5 in Exhibit 5 shows the results from the model allowing for two unobserved heterogeneous groups.

$$\Pr(y_{it} = j) = \frac{e^{\beta_j Z_{it} + \gamma_j C_{it} + v_{jm}}}{1 + \sum_{k=1}^4 e^{\beta_k Z_{it} + \gamma_k C_{it} + v_{jm}}} \text{ for } j = 1,2,3,4$$

$$\Pr(y_{it} = j) = \frac{1}{1 + \sum_{k=1}^4 e^{\beta_k Z_{it} + \gamma_k C_{it} + v_{jm}}} \text{ for } j = 0. \tag{2}$$

$$\ln L = \sum_{m=1}^M p_m \left( \sum_{t=1}^T \sum_{i=1}^n \sum_{j=0}^4 d_{ijt} \ln(\Pr(y_{it} = j)) \right),$$

$$\sum p_m = 1$$

The fourth potential problem is the borrower assignment/selection issue as it relates to counseling. The sample selection and endogeneity issues need to be addressed to determine whether the estimated impacts capture only the effect of counseling itself. First, the MNL model treats all the delinquencies that were not counseled (or contacted) as the control group. However, many delinquent borrowers were not referred for counseling because their servicers did not participate in the program. For those referred, the more “motivated” lower-risk delinquent borrowers may disproportionately choose to receive the counseling service, which results in an overestimate of the benefits of the counseling service. However, it is also possible that lower-risk delinquent borrowers are less motivated to receive counseling because they have more confidence in self-curing. A series of models focusing on delinquencies handled by the participating servicers were run to address this issue, where all delinquencies had the opportunity to receive

**Exhibit 5** | MNL Estimation of the Impact of Counseling on 60-day Delinquencies (All Servicemembers)

Risk	Variable	Model 1 / Full Sample		Model 2 / Study Sample		Model 3 / Prior Counsel		Model 4 / Counsel in Spell		Model 5 / Heterogeneity	
		Coeff.	RRR	Coeff.	RRR	Coeff.	RRR	Coeff.	RRR	Coeff.	RRR
Delinq	<i>call</i>	-0.014	0.986	0.047	1.048	0.047	1.049	0.043	1.044	0.198**	1.219
	<i>put</i>	-0.391***	0.676	-0.637***	0.529	-0.636***	0.529	-0.638***	0.528	-0.582***	0.559
	<i>lupb</i>	0.009	1.009	0.005	1.005	0.005	1.005	0.004	1.004	0.054	1.056
	<i>af_american</i>	0.730***	2.075	0.761***	2.141	0.754***	2.126	0.756***	2.130	1.054***	2.869
	<i>delinq</i>	0.458***	1.582	0.503***	1.654	0.501***	1.650	0.502***	1.652	0.503***	1.653
	<i>loanage</i>	-0.206***	0.814	-0.246***	0.782	-0.248***	0.780	-0.254***	0.776	-0.160	0.852
	<i>dur</i>	-0.412***	0.663	-0.410***	0.664	-0.411**	0.663	-0.411***	0.663	-0.058	0.944
	<i>unemp_rate</i>	0.027	1.027	0.055	1.056	0.055	1.056	0.059	1.061	0.158**	1.171
	<i>hpi_a</i>	-0.030	0.971	-0.119	0.888	-0.116	0.890	-0.122	0.885	-0.124	0.883
	<i>nc</i>	-0.043	0.958	-0.036	0.965	-0.035	0.966	-0.057	0.945	0.007	1.008
	<i>counsel<sup>a</sup></i>					0.176	1.193	0.161	1.175	0.063	1.065
<i>contact<sup>a</sup></i>					-0.148	0.863	0.118	1.125	0.064	1.066	
Cured	<i>call</i>	-0.109**	0.897	-0.059	0.942	-0.059	0.943	-0.069	0.933	-0.112*	0.894
	<i>put</i>	-0.483***	0.617	-0.749***	0.473	-0.745***	0.475	-0.755***	0.470	-0.954***	0.385
	<i>lupb</i>	-0.055	0.946	-0.051	0.950	-0.051	0.951	-0.053	0.949	-0.066	0.937
	<i>af_american</i>	0.652***	1.919	0.684***	1.981	0.681***	1.977	0.668***	1.950	0.696***	2.006
	<i>delinq</i>	0.519***	1.680	0.597***	1.817	0.597***	1.816	0.595***	1.814	0.675***	1.964
	<i>loanage</i>	-0.275***	0.760	-0.321***	0.725	-0.315***	0.730	-0.341***	0.711	-0.458***	0.633
	<i>dur</i>	-1.071***	0.343	-1.112***	0.329	-1.113***	0.329	-1.128***	0.324	-1.519***	0.219
	<i>unemp_rate</i>	-0.018	0.982	-0.017	0.983	-0.017	0.983	-0.008	0.992	-0.007	0.993
	<i>hpi_a</i>	0.003	1.003	-0.094	0.911	-0.089	0.914	-0.098	0.907	-0.202*	0.817
	<i>nc</i>	-0.110	0.896	-0.140	0.869	-0.135	0.873	-0.188	0.829	-0.175	0.839
	<i>counsel<sup>a</sup></i>					0.116	1.123	0.411*	1.509	0.655**	1.925
<i>contact<sup>a</sup></i>					-0.203	0.816	0.313	1.368	0.378	1.460	

**Exhibit 5** | (continued)

MNL Estimation of the Impact of Counseling on 60-day Delinquencies (All Servicicers)

Risk	Variable	Model 1 / Full Sample		Model 2 / Study Sample		Model 3 / Prior Counsel		Model 4 / Counsel in Spell		Model 5 / Heterogeneity	
		Coeff.	RRR	Coeff.	RRR	Coeff.	RRR	Coeff.	RRR	Coeff.	RRR
Prepaid	<i>call</i>	-0.046	0.955	-0.040	0.960	-0.037	0.964	-0.042	0.959	0.120	1.128
	<i>put</i>	-0.721***	0.486	-0.932***	0.394	-0.903***	0.405	-0.932***	0.394	-0.875***	0.417
	<i>lupb</i>	0.204**	1.227	0.213*	1.238	0.213*	1.238	0.213*	1.237	0.261**	1.299
	<i>af_american</i>	-0.167	0.846	-0.223	0.800	-0.176	0.839	-0.224	0.799	0.086	1.090
	<i>delinq</i>	0.372***	1.451	0.491***	1.634	0.501***	1.650	0.488***	1.629	0.483***	1.620
	<i>loanage</i>	-0.443***	0.642	-0.426***	0.653	-0.362***	0.696	-0.428***	0.652	-0.326**	0.722
	<i>dur</i>	-0.864***	0.421	-0.859***	0.423	-0.848***	0.428	-0.856***	0.425	-0.456***	0.634
	<i>unemp_rate</i>	0.168**	1.183	0.246***	1.279	0.241***	1.273	0.248***	1.282	0.356***	1.427
	<i>hpi_a</i>	0.120	1.128	0.063	1.065	0.073	1.076	0.059	1.061	0.059	1.061
	<i>nc</i>	-0.406**	0.666	-0.401*	0.670	-0.373*	0.689	-0.403*	0.668	-0.336	0.715
	<i>counsel<sup>a</sup></i>					-0.594	0.552	0.221	1.248	0.094	1.099
	<i>contact<sup>a</sup></i>					-1.014*	0.363	-0.307	0.735	-0.377	0.686
	Modified	<i>call</i>	0.017	1.017	-0.152	0.859	-0.149	0.862	-0.138	0.871	-0.153
<i>put</i>		0.102*	1.107	0.399	1.490	0.416	1.517	0.417	1.518	0.396	1.486
<i>lupb</i>		0.412***	1.510	0.391***	1.478	0.392***	1.479	0.390***	1.477	0.379***	1.461
<i>af_american</i>		0.486**	1.625	0.464*	1.591	0.481*	1.618	0.487*	1.628	0.547**	1.727
<i>delinq</i>		0.440***	1.553	0.500***	1.649	0.510***	1.665	0.509***	1.664	0.552***	1.737
<i>loanage</i>		0.333***	1.396	0.252	1.287	0.296*	1.345*	0.284	1.328	0.268	1.308
<i>dur</i>		-0.199***	0.820	-0.184*	0.832	-0.187*	0.829*	-0.165	0.848	-0.260*	0.771
<i>unemp_rate</i>		0.109	1.115	0.147	1.158	0.146	1.157	0.135	1.144	0.151	1.163
<i>hpi_a</i>		0.368***	1.445	0.502***	1.652	0.511***	1.667	0.507***	1.661	0.523**	1.686
<i>nc</i>		-0.231	0.794	-0.156	0.855	-0.140	0.869	-0.094	0.910	-0.074	0.929

**Exhibit 5** | (continued)

MNL Estimation of the Impact of Counseling on 60-day Delinquencies (All Servicers)

Risk	Variable	Model 1 / Full Sample		Model 2 / Study Sample		Model 3 / Prior Counsel		Model 4 / Counsel in Spell		Model 5 / Heterogeneity	
		Coeff.	RRR	Coeff.	RRR	Coeff.	RRR	Coeff.	RRR	Coeff.	RRR
	<i>counsel</i> <sup>a</sup>					-0.024	0.977	-1.702	0.182	-1.724	0.178
	<i>contact</i> <sup>a</sup>					-0.851	0.427	-0.297	0.743	-0.306	0.736
	<i>mass</i>									-1.603***	
constant	<i>delinq</i>	3.935***		3.847***		3.847***		3.840***		13.178***	
	<i>cured</i>	1.592***		1.414***		1.418***		1.390***		0.894***	
	<i>prepaid</i>	-0.438***		-0.529***		-0.477***		-0.527***		4.208***	
	<i>modified</i>	-1.677***		-1.570***		-1.540***		-1.540***		1.337***	
										8.875***	
										-6.267***	
										-1.397***	
										-1.545***	

Note: All continuous variables are standardized for estimation. Please refer to Exhibit 4 for a detailed description of the variables. RRR is the relative risk ratio and the reference group if foreclosure. Model 1: N = 30,043 of 2,089 loans and log likelihood = -13,341.6\*\*\*; Model 2: N = 22,925 of 1,689 loans and log likelihood = -10,052.2\*\*\*; Model 3: N = 22,925 of 1,689 loans and log likelihood = -10,047.4\*\*\*; Model 4: N = 22,925 of 1,689 loans and log likelihood = -10,043.4\*\*\*; Model 5: N = 22,925 of 1,689 loans and log likelihood = -10,010.9\*\*\*.

<sup>a</sup>The counseling variables are *counsel\_bef* and *contact\_bef* for Model 3 and *counsel\_spell* and *contact\_spell* for Model 4 and Model 5.

- \* Significant at the 0.1 level.
- \*\* Significant at the 0.05 level.
- \*\*\* Significant at the 0.01 level.

counseling. The results were compared with a two-stage selection model designed to control for the endogeneity issue, following the idea of Hirad and Zorn (2002).

In the two-stage selection model, delinquent borrowers select or are assigned to receive different levels of counseling: contact only or counseling. The first stage of the analysis uses a multinomial logit model to estimate the different levels of counseling a delinquent borrower may select. The probability estimates are incorporated into a simplified version of the multinomial logit model. Specifically, the MNL model is estimated as:

$$\Pr(y_i = j) = \frac{e^{(\beta_j Z_i + \hat{P}(X) \gamma_j)}}{1 + \sum_{k=1}^4 e^{(\beta_k Z_i + \hat{P}(X) \gamma_k)}} \text{ for } j = 1, 2, 3, 4, \quad (3)$$

where  $X$  contains a set of predictors of whether borrowers are assigned to or select different levels of counseling services, and  $\hat{P}(X)$  is a vector of predicted probabilities, while  $\gamma$  are column vectors of estimated coefficients. Different from the previous models where monthly data are used,  $Z$  includes borrower and loan characteristics at the time of default. Since the borrower’s selection process here is very complicated—a delinquent borrower may be referred multiple times, and the referrals may result in different levels of treatment—the problem is simplified by using a cross-sectional dataset and focusing solely on the highest level of treatment a borrower received during a delinquency spell.

Identification of the assignment/selection model is ensured by the inclusion of variables not in the transition model. Based on available data, the following variables are used to predict a borrower’s assignment/selection of counseling services: borrower gender, LTV ratio, dummies of year when a delinquency starts, and whether the borrower received counseling previously.

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### Empirical Analysis

The majority of the 60-day delinquencies were cured (65.5%), 7% were prepaid, about 14% ended in foreclosure, and about 10% were still in delinquency at the end of the study period (Exhibit 3). If the final outcomes of delinquent loans are examined without considering those temporarily cured spells, among the 1,689 60-day delinquent loans, 25% went to REO or foreclosure, 13% were prepaid (distressed prepayment), and 39% were cured. Many delinquent borrowers were able to pay off their mortgages through refinancing or sale of the property,<sup>12</sup> probably because of significant appreciation in the property value during the study period.

Exhibit 3 shows the outcomes of delinquency spells by both the timing and level of counseling. For spells that had been counseled before the current delinquency,

the curing rate is similar to that of the “contact” and the “none” groups (65%, 65%, and 66%, respectively). In contrast, delinquencies that received counseling during the spells have a higher curing rate (72%) than those that did not (either “none” or “contact”). The foreclosure rates are similar across different levels of counseling services and are a little lower for those who received counseling.

The impact of different levels of counseling service based on when the counseling was received (*counsel\_spell*, *contact\_spell*, *counsel\_bef*, and *contact\_bef*) are considered to test whether delinquent borrowers who receive counseling are more likely to reinstate or cure than similarly situated non-counseled borrowers. The highest level of treatment is used for borrowers who received multiple treatments. Delinquent borrowers who were not referred are classified as “none.” Counseling received during the current delinquency spell is expected to increase the probability of cure and reduce the risk of foreclosure, since timely delinquent counseling should be more effective. In addition, if current delinquency is not triggered by crisis events beyond a borrower’s control, then the borrower who received counseling would be expected to have a higher probability of curing than those not-counseled, since counseled borrowers should have better knowledge and thus be better able to handle delinquencies. However since the effects of counseling may diminish with time, it is also possible that prior counseling is less effective.

Many factors other than counseling may influence the outcomes of delinquencies. The following variables have been controlled in the MNL model (Exhibit 4 provides summary statistics for different samples):

- **Value of the Put Option:** According to the option-based theory, home equity plays a central role in determining the probability of foreclosure. The value of the put option of a loan for each month is calculated using the unpaid mortgage balance, and the estimated house price is calculated using the house price index (HPI) of the Office of Federal Housing Enterprise Oversight (OFHEO).<sup>13</sup> The value of the put option indicates the ratio of negative equity (unpaid balance minus estimated house price) to the original house price.
- **Value of the Call Option:** To determine whether the call option is “in the money,” the present discounted value of the current mortgage is compared with the present discounted value of a prevailing market-rate mortgage.<sup>14</sup> Saving from refinancing is reported as a ratio, which indicates the fraction of saving by taking a refinancing mortgage with the prevailing market rate.
- **Past Loan Performance:** Past loan performance is likely to be predictive of future loan performance. A measure is included that indicates the share of months in which a loan is in delinquency before reaching the 60-day delinquency.
- **Loan Size:** Loan size is measured by the amount of unpaid balance in the loan.

- **Loan Age:** This variable measures loan age in years when a default starts.
- **Time in Delinquency:** This variable indicates the number of months in current 60-day delinquency.
- **Borrower Race:** As suggested in the literature (e.g., Anderson and VanderHoff, 1999), African-American borrowers may have higher default rates on conventional residential mortgages than other borrowers, so a dummy variable is included to identify African-American borrowers.
- **Local Economic Conditions:** A borrower's ability to cure a delinquency or sell a property may also depend on local economic conditions. To capture local economic impacts, monthly state unemployment rates and MSA house price appreciation rates relative to the same quarter in the previous year are included as indicators of general economic conditions.<sup>15</sup> A dummy for borrowers in North Carolina is also included, because a disproportionate number of borrowers in the sample are located there.

Exhibit 5 lists the results of five models of the transition of 60-day delinquent loans using different study samples or different specifications. Model 1 uses a sample of all 60-day delinquencies (January 1998 to September 2006). Model 2 focuses on 60-day delinquencies during the study period (January 2003 to September 2006). Model 3 adds the prior counseling variables to Model 2, and Model 4 considers counseling received during delinquency spells. Model 5 further allows for unobserved heterogeneities among borrowers. All the continuous variables have been standardized for estimation. A positive coefficient means that the odds of the particular outcome rather than the reference group (foreclosure) increase as the independent variable increases; a negative coefficient means the odds decrease. The value of RRR is the relative risk ratio for a one-unit change in the corresponding variable. It measures the risk of the category relative to the base category, which is foreclosure here. For example, from Model 1, the odds that an African-American borrower will remain in delinquency rather than foreclosure are about 2.1 times the odds for non-black borrowers. In general, the reported results of Model 1 are consistent with those of Model 2, in that estimated coefficients for the explanatory variables are of the same sign and similar size. So the results are reliable, since the bias from focusing on a smaller sample during a shorter observation period is not serious.

The results in Model 3 generally suggest that prior counseling has no significant impact on the transition of delinquent loans. The coefficients for the prior counseling variables in Model 3 are generally insignificant except *contact\_bef*, which has a slightly significant (at the 0.1 level) impact on the outcome of prepayment, and the value is negative. These results have been confirmed with models using different samples and specifications that are not listed in Exhibits 5 and 6.

The results of Model 4 and Model 5 show some evidence that counseling received during delinquency spells significantly increases the probability of curing (significant at the 0.1 level in Model 4 and 0.05 level in Model 5). No significant

**Exhibit 6** | MNL Estimates of the Impact of Counseling on 60-day Delinquencies (Participating Servicers)

Risk	Variable	Model 6 / Participating Servicers		Model 7 / Cross-sectional		Model 8 / Selection Model	
		Coeff.	RRR	Coeff.	RRR	Coeff.	RRR
Delinq	<i>call</i>	0.035	1.035	0.164	1.179	0.150	1.161
	<i>put</i>	-0.222	0.801*	0.428	1.535	0.460	1.583
	<i>lupb</i>	-0.068	0.934	-0.184	0.832	-0.205	0.815
	<i>af_american</i>	0.775	2.170***	1.295***	3.651	1.301	3.671***
	<i>delinq</i>	0.605***	1.832***	0.997***	2.709	1.004	2.730***
	<i>loanage</i>	-0.176***	0.839*	1.950***	7.025	1.940	6.956***
	<i>dur</i>	-0.333	0.716***	1.126	3.084***	1.133	3.106***
	<i>unemp_rate</i>	0.098	1.103	0.006	1.006	0.004	1.004
	<i>hpi_a</i>	0.132	1.142	0.687	1.987***	0.716	2.047***
	<i>nc</i>	-0.141	0.868	-0.968	0.380***	-0.953	0.385***
	<i>counsel_spell</i>	0.167	1.182	-0.065	0.937	0.624	1.867
	<i>contact_spell</i>	0.106	1.112	-0.218	0.804	-0.555	0.574
	Cured	<i>call</i>	-0.058	0.943	-0.078	0.925	-0.098
<i>put</i>		-0.257	0.773*	-0.057	0.945	-0.044	0.957
<i>lupb</i>		-0.202	0.817**	-0.210	0.811**	-0.204	0.816**
<i>af_american</i>		0.756	2.130***	0.785	2.193***	0.796	2.217***
<i>delinq</i>		0.712	2.039***	0.764	2.146***	0.759	2.136***
<i>loanage</i>		-0.293	0.746***	-0.178	0.837	-0.182	0.834
<i>dur</i>		-1.007	0.365***	-0.950	0.387***	-0.875	0.417***
<i>unemp_rate</i>		0.031	1.032	0.122	1.130	0.119	1.126
<i>hpi_a</i>		0.133	1.142	0.204	1.226*	0.213	1.238*
<i>nc</i>		-0.263	0.769	-0.337	0.714*	-0.314	0.731*
<i>counsel_spell</i>		0.437	1.548*	0.810	2.249***	1.701	5.477*
<i>contact_spell</i>		0.339	1.404	0.455	1.576*	0.281	1.324
Prepaid + Modified		<i>call</i>	0.021	1.022	0.048	1.050	0.044
	<i>put</i>	-0.444	0.641***	-0.373	0.688**	-0.353	0.702**
	<i>lupb</i>	-0.029	0.971	0.079	1.082	0.076	1.079
	<i>af_american</i>	0.108	1.114	0.163	1.177	0.168	1.183
	<i>delinq</i>	0.602	1.826***	0.615	1.850***	0.615	1.849***
	<i>loanage</i>	-0.393	0.675***	-0.300	0.741*	-0.258	0.772
	<i>dur</i>	-0.540	0.583***	-0.415	0.660***	-0.416	0.660***
	<i>unemp_rate</i>	0.302	1.352**	0.252	1.287	0.229	1.257
	<i>hpi_a</i>	0.215	1.239	0.058	1.060	0.050	1.052
	<i>nc</i>	0.143	1.153	-0.240	0.787	-0.245	0.783
	<i>counsel_spell</i>	-0.038	0.963	0.180	1.197	0.155	1.168
	<i>contact_spell</i>	-0.107	0.899	0.049	1.051	-1.185	0.306
	constant	<i>delinq</i>	3.854***		-1.400***		-1.454***
<i>cured</i>		1.256***		1.368***		1.256***	
<i>Prepay+ Modified</i>		-0.756***		-0.531**		-0.395	

**Exhibit 6** | (continued)

MNL Estimates of the Impact of Counseling on 60-day Delinquencies (Participating Servicers)

*Note:* All continuous variables are standardized for estimation. Please refer to Exhibit 4 for a detailed description of the variables. RRR is the relative risk ratio and the reference group is foreclosure. Model 7:  $N = 12,385$  of 781 loans and  $\log \text{likelihood} = -4,762.2^{***}$ ; Model 8:  $N = 1,436$  of 781 loans and  $-1,087.8^{***}$ ; Model 9:  $N = 1,436$  of 781 loans and  $\log \text{likelihood} = -1,093.9^{***}$ .

\* Significant at the 0.1 level.  
 \*\* Significant at the 0.05 level.  
 \*\*\* Significant at the 0.01 level.

impact of the contact variable (*contact\_spell*) is found for all outcomes, confirming the effectiveness of counseling over a brief contact during a delinquency spell. The odds of curing were 50% higher for borrowers who received counseling services than for those who did not, relative to foreclosure. As Exhibit 8 shows, this model predicts that if borrowers receive counseling immediately after they enter a 60-day delinquency, the probability of curing in six months will be 18% higher than for the borrowers who do not receive such counseling. Their predicted foreclosure rates are much lower than those non-counseled borrowers. Compared to the results from Model 3, the results suggest that counseling services have a significant impact on curing only if the borrower receives counseling during the current delinquency spell.

Model 5 confirms the existence of unobserved heterogeneities among borrowers. The mass-point estimate of  $-1.603$  undergoes a logistic transformation and

**Exhibit 7** | Goodness-of-Fit for Multinomial Logit Assignment/selection Estimation

Actual Participation	Mean Predicted Probabilities of Participation			
	None	Contact	Counsel	<i>N</i>
None	78.9%	10.0%	11.1%	1,085
Contact	65.4%	20.1%	14.5%	168
Counsel	65.6%	13.7%	20.7%	183
Total	75.6%	11.7%	12.7%	1,436

*Note:* The predictors include borrower gender (female), original LTV ratio ( $\geq 97\%$ ), interest rate spread (note rate minus the prevailing market rate at origination), dummy of the starting year of delinquency, and dummies of whether the borrower received counseling services previously.

indicates that approximately 83% of the delinquencies are in Group 1 and 17% are in Group 2. As the values of the location parameters in Model 5 suggest, Group 1 includes delinquencies with a relatively high probability of curing, prepayment, loan modification, or remaining in delinquency; consequently, these delinquencies have a low probability of ending in foreclosure.<sup>16</sup> Group 2 includes delinquencies that have a relatively high probability of foreclosure. The signs and magnitude of the parameters of the mass-point model are generally consistent with the multinomial model, although a few more variables become significant. In particular, the magnitude of the counseling variable's relative risk ratio on the probability of curing is even larger and significant at the 0.05 level.

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### Assignment/Selection Model

It should be noted that there are still some sample selection and endogeneity issues in Model 4. A series of models were tested that focus on the delinquencies that were handled by the participating servicers and had the opportunity to receive counseling to determine whether the results hold. The three models in Exhibit 6 focus solely on delinquencies handled by participating servicers. Like Model 4, Model 6 uses a MNL model and a monthly dataset. Model 7 uses cross-sectional data by focusing on loan and borrower characteristics at the beginning of default. Model 8 is the borrower assignment/selection model. Because the sample size is small and there are only a few loan modifications (36), the outcomes of loan modifications and prepayments are combined into one. However, because of the "independence of irrelevant alternatives" assumption of the MNL model, this method will not change the estimates for the outcomes of curing or delinquency, the primary research interest.

Again, as Model 6 shows, the qualitative results generally do not change when focusing on the delinquencies served by participating servicers. The only noticeable change is that the loan size variable (*lupb*) becomes significant for curing, although the sign remains the same. Model 7 uses cross-sectional data. Compared to the results of Model 6, there are some significant differences for the outcome of "delinquent," including the direction of the impact of the put option (*put*), loan age (*loanage*), and the delinquency duration variable (*dur*); the significance of house price appreciation variable (*hpi\_a*); and the dummy variable for North Carolina residents (*nc*). This is primarily because Model 7 focuses on loan and borrower characteristics at the time of default and uses the duration of the whole delinquency spell for the duration variable. Model 7 fails to make full use of the information during a delinquency spell (when the statuses are delinquent), and thus the results for the outcome of delinquency change significantly. However, for other outcomes the results of Model 7 are generally consistent with those of Model 6. These results confirm that counseling has a significant and positive impact on curing and that a contact has a slightly significant (0.1 level) impact. The odds of curing are 2.2 times more for borrowers who received counseling than for those who did not, relative to the odds of foreclosure.

The assignment/selection model first uses a MNL model to estimate the probability that a delinquent borrower will receive different levels of counseling, either “contact” or “counsel.” If the model fits especially well then the mean predicted probability of counseling should be highest for borrowers who did receive counseling during delinquency spells. There are many unobserved factors, however, that likely are important in explaining counseling assignment/selection (e.g., employment status, current credit risk, household financial situation, whether a borrower filed for bankruptcy, etc.). As a result, the MNL estimation yields an adequate—but not particularly well-fitting—model. This is illustrated in Exhibit 7, which shows the mean predicted probabilities of counseling (contact or counsel) for each subgroup of actual level of outcomes.

In the second stage, the multinomial logit model of Equation (3) is estimated using the estimated probability of counsel/contact instead of the observed values (Model 8 in Exhibit 6). There is still some evidence that counseling has a significant impact on the probability of curing after controlling for the endogeneity of assignment/selection: the coefficient of the counseling is positive for the outcome of curing and significant at the 0.1 level. The magnitude of the coefficient is even greater, while the contact variable becomes insignificant. Therefore, counseling’s estimated effectiveness is not due entirely to borrowers’ assignment/selection to counseling.

In summary, employing models that use different samples demonstrates that the sample selection does not cause serious bias. The assignment/selection analysis further provides evidence in support of the overall conclusion that timely counseling can significantly increase the curing rate for moderately delinquent borrowers. There are some additional explanations for the finding that prior counseling services are not so effective in curing delinquencies. First, the effectiveness of counseling may diminish with time. The environment and the borrower’s situation may have changed radically to make prior counseling no

**Exhibit 8** | Predicted Probability of Outcomes: Impact of Counseling

Months	Foreclosure		Delinquent		Cure		Prepay+Modified	
	None	Counseled	None	Counseled	None	Counseled	None	Counseled
3	3.3%	2.6%	59.4%	53.9%	32.7%	39.5%	4.7%	4.0%
6	5.6%	4.3%	37.9%	31.9%	49.2%	57.8%	7.3%	6.0%
9	7.3%	5.5%	25.7%	20.3%	58.1%	67.1%	8.9%	7.1%
12	8.7%	6.4%	18.2%	13.8%	63.1%	72.0%	10.0%	7.7%

*Note:* Projection is for a non-North Carolina non-black borrower with the mean value of all continuous regressors except the duration variable. “Counseled” represents that the delinquent borrower receives counseling immediately after entering a 60-day delinquency.

longer effective. Second, if prior counseling was entirely effective, borrowers would not have entered a new delinquency. Generally, the results support the hypothesis that timely counseling is effective in increasing curing probability, but the same is not necessarily true for prior counseling or multiple treatments.

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### Empirical Results of Other Control Variables

Since results from the mass-point model and selection model are generally consistent with the MNL model, the results of the other variables can be interpreted based primarily on Model 4.

- **Value of the Put Option:** Delinquent borrowers with less or negative equity in their home (larger value of *put*) are less likely to cure, prepay, or stay in delinquency. Instead, they are also more likely to end in foreclosure. They are also more likely to undergo loan modifications, perhaps because this is the best option for a borrower with scant home equity who demonstrates a willingness and ability to retain the home. The results confirm that delinquent loans with little or negative equity are more likely to terminate through foreclosure or loan modification. When there is substantial equity in the home, delinquent borrowers are more likely to find solutions other than foreclosure.
- **Value of the Call Option:** The call option (*call*) does not have a significant effect on the outcome of delinquencies. Delinquent borrowers are unable to refinance their mortgages in the prime market because of their high credit risk, even when the call option is significantly “in the money.” Instead, the probability of “distressed prepayment” is more closely associated with equity in the home, loan age, time in delinquency, local economic conditions, and some borrower characteristics, such as borrower race.
- **Past Loan Performance:** Previous delinquency behavior is a significant factor in predicting foreclosure. Loans that have been delinquent over longer periods prior to the current delinquency spell are less likely to terminate through foreclosure. One possible explanation is the effect of the borrower’s learning curve on the delinquency process. Borrowers learn from prior experience and are thus more likely to survive current delinquencies and avoid foreclosures. Considering Self-Help’s general servicing philosophy, another explanation is servicers’ forbearance toward habitually delinquent borrowers. Since servicers have shown considerable forbearance in the past, it is very likely that this pattern would continue.
- **Loan Size:** Delinquent loans with relatively larger balances are more likely to be terminated through modification and prepayment rather than through foreclosure. Since there is usually a fixed cost associated with refinance, home sale, and loan modification, the relative cost for a loan

with a larger unpaid balance should be lower; as a result, borrowers have a stronger incentive to pay off or modify their loans.

- **Loan Age:** The results show that older loans are more likely to end in foreclosure. However, these results need to be interpreted cautiously, as the observation period is too short to observe the final outcomes for some recent originations.
- **Time in Delinquency:** Longer time in delinquency is found to be negatively associated with the probability of curing, prepayment, and remaining in delinquency. Thus a longer stay in delinquency is positively associated with the outcome of foreclosure. This is understandable, since the foreclosure process usually takes months or even years. The larger expenses incurred from a longer stay in delinquency would make it difficult for the borrower to cure the delinquency.
- **Borrower Race:** African-Americans are significantly more likely to stay in delinquency and less likely to cure or prepay, relative to ending in foreclosure. It is possible that lenders tend to give minorities more time to work out their situations before commencing foreclosure. It is also possible that some unobserved characteristics are not captured by the model.
- **Local Economic Conditions:** The local economic condition variables are generally insignificant in the model. There are two exceptions: area unemployment rates are positively associated with the probability of distressed prepayment, and higher area housing appreciation rates are associated with a higher probability of loan modification, relative to foreclosure. Generally, the model predicts that in areas where property appreciation rates are high, delinquent borrowers are more likely to find alternatives to foreclosure, such as sale of the home, or modifications that allow them to keep the home. The model also predicts that in a weak job market delinquencies are less likely to cure and borrowers are more likely to pay off their mortgages. Finally, there is no significant difference between the behaviors of North Carolina delinquent borrowers and those in other states except some variation in prepayment behavior.

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## Conclusion

The proliferation of affordable mortgages with expanded eligibility criteria has enabled more LMI families to become homeowners. At the same time, increased lending to households with limited financial resources raises the likelihood of higher default rates. Efforts to promote homeownership among LMI households will only succeed if accompanied by measures to control default rates and increase curing rates for borrowers already reaching delinquency. In particular, post-purchase delinquency counseling has been considered an important mechanism to help delinquent borrowers establish a budget, set priorities, and find the appropriate strategies to avoid foreclosure and cure delinquency.

Based on a sample of affordable loans serving LMI borrowers, there is significant evidence that proactive counseling services successfully increase the probability of curing. The results demonstrate that timely delinquency counseling, even when given over the phone, effectively increases curing probability. The analysis also confirms that counseling's estimated effectiveness is not entirely attributable to unobserved differences in borrower characteristics. However, the success of counseling appears to depend on timing; that is, counseling should address an *active* delinquency situation. Repeated counseling appears to have diminishing returns. These findings suggest that well-timed, situation-appropriate counseling is more effective and efficient in increasing curing probability.

The results of this study have important implications for whether and how mortgage counseling should be provided. In general, previous research demonstrates that pre-purchase intensive counseling (usually classroom and individual counseling) is effective in reducing default risk. However, as demonstrated in this study, delinquency counseling over the phone can also increase the curing probability for those already in delinquency. Although it might be more costly to intervene prior to 90 days because of the high rate of borrower self-cures, this research provides evidence that an early intervention may be important for some delinquent borrowers, as it is sometimes impossible to intervene successfully if a delinquency becomes very serious.

At the same time, the research leaves many questions unanswered. Specifically, further studies would benefit from a more comprehensive evaluation of the long-term viability of those loans that received counseling and an evaluation of the cost-benefits of counseling services provided in different stages.

Further, factors were identified that influence the paths of moderately (60-day) delinquent loans. This study confirms that home equity plays an important role in determining who is more likely to reach foreclosure or seek other solutions. Loan payment history also affects outcomes: the longer the delinquency spell, the more likely the loan will end in foreclosure and the less likely to cure. However, loans that have had more prior delinquencies are actually less likely to end in foreclosure, very probably because of lenders' forbearance and borrowers' learning from experience. Local economic conditions and borrower characteristics also matter in the transition of moderately delinquent loans. In sum, delinquent affordable loans can follow a variety of courses; the ultimate fortunes of these delinquent loans are impacted by a number of factors, including loss prevention interventions.

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## Endnotes

<sup>1</sup> The delinquency rate for residential mortgages stood at 4.84% of all loans outstanding in the first quarter of 2007 [Mortgage Bankers Association (MBA), 2007]. More than one million subprime loans were delinquent or in foreclosure in the first quarter of 2007. The percentage of mortgages in the foreclosure process was a record high (1.28%) in the first quarter of 2007 (MBA, 2007).

- <sup>2</sup> According to Frank Nothaft (email exchange with Lei Ding on July 13, 2007), in the Servicing Conference in February 2007, Freddie Mac changed its repayment plan incentive to reward servicers for successful repayment plans that had been initiated at 60-day delinquencies, instead of at 90-day. Freddie Mac had seen an approximate 45% pick up in successfully completed repayment plans when these plans were initiated earlier in the process.
- <sup>3</sup> To qualify for the CAP program, borrowers must meet one of three criteria: (1) have an income under 80% of the area median income (AMI) for the metropolitan area; (2) be a minority with an income below 115% of AMI; or (3) purchase a home in a high-minority (>30%) or low-income (<80% AMI) census tract and have an income below 115% AMI.
- <sup>4</sup> The 45-day delinquent loans could not be identified because the monthly records used cannot identify the exact date of delinquency. However, the number of months the borrower had missed making regular payments at the beginning of each month is known. According to the records, many delinquent borrowers had already progressed to 60-day delinquencies at the time of contact, while others were current or only 30-days delinquent when they were reached.
- <sup>5</sup> In the early stage of the CAP program, Self-Help was not directly involved in servicing. As a result, lenders serviced the loans according to Fannie Mae guidelines without oversight from Self-Help. It was not until late 2002 that Self-Help developed its own philosophy, which allowed it to become more active in the servicing arena. Since 2003, Self-Help has established servicing guidelines and been active in the loss mitigation process.
- <sup>6</sup> The “limited indemnity” rule requires lenders to retain the main recourse on loans until 12 consecutive on-time payments are made. Of the 2,835 60+ day delinquencies in Exhibit 2, 283 were returned to the original lenders. These delinquent loans were excluded from the analysis because Self-Help could not track their performance afterward.
- <sup>7</sup> As the payment history data suggests that a number of early-stage delinquencies (30-day) may be driven by pending refinancing plans, only those loans in moderate and serious delinquencies (60+ day) are treated as “distressed prepayments.”
- <sup>8</sup> Most loans in this category (about 60%) became more delinquent (90+ day). According to Self-Help, many of the borrowers in this category had filed for bankruptcy, which allows them to remain in delinquency, since foreclosure proceedings may not take place until after bankruptcies are settled. Unfortunately, a complete list of those borrowers who filed for bankruptcy was not available.
- <sup>9</sup> This term is from Danis and Pennington-Cross (2005), who find that delinquent borrowers are more likely to prepay than end in foreclosure. They called this type of prepayment “distressed prepayment.”
- <sup>10</sup> The category of foreclosure includes REO, REO sold, third-party sale, and pre-foreclosure sale.
- <sup>11</sup> To ensure that the proportions lie within [0, 1] and sum to 1, a logistic transformation is used on mass-point estimates:

$$p_m = \exp(q_m) / (1 + \sum \exp(q_m)),$$

where  $-\infty < q_m < \infty$  and the value of  $p_m$  lies within [0, 1].

- <sup>12</sup> In an ongoing six-year panel survey, the authors are tracking a sample of over 3,700 CAP borrowers and whether or not they have moved is known. Among the 30 distressed prepaid borrowers in this sample, 40% (12) have moved and it is assumed that they sold their homes. The rest (60%) of the prepaid borrowers did not move; very likely they refinanced their mortgages using high cost subprime loans because of their higher risk.
- <sup>13</sup> Since the OFHEO house price index at the Metropolitan Statistical Area (MSA) level is available quarterly, each month in the same quarter is assumed to have the same appreciation rate. If the property is located in an area outside of an MSA, state level HPI is used. Given the MSA house price index  $HPI_{i0}$  at origination and  $HPI_{it}$  in month  $t$ , the value of the put option for house  $i$  with an original purchase price  $P_{i0}$  can be calculated for each month,  $t$ :

$$put_{it} = \frac{(upb_{it} - P_{i0} * (HPI_{it}/HPI_{i0}))}{P_{i0}}.$$

- <sup>14</sup> Given the original balance ( $OB_i$ ), the term of the mortgage ( $TM_i$ ), and the interest rate on the mortgage ( $R_i$ ) for a fixed rate mortgage  $i$ , the monthly payments can be calculated:

$$PAY_i = R_i * OB_i \left[ \frac{(1 + R_i)^{TM_i}}{(1 + R_i)^{TM_i} - 1} \right].$$

The future monthly payments ( $PAY_i$ ) are then discounted by the interest rate ( $R_i$ ) and prevailing interest rate ( $PR_i$ ) separately. The Freddie Mac Primary Mortgage Market Survey (PMMS) is used to proxy for prevailing interest rates on prime, conventional, and fixed-rate mortgages:

$$PDC_{cit} = \sum_{m=i}^{TM_i} \frac{PAY_i}{(1 + R_i)^m} \quad PDC_{rit} = \sum_{m=i}^{TM_i} \frac{PAY_i}{(1 + PR_i)^m}.$$

The call option is defined as the difference in the present values of the payment stream at the mortgage note rate and the prevailing interest rate:

$$call_{it} = \frac{PDC_{rit} - PDC_{cit}}{PDC_{rit}}.$$

- <sup>15</sup> Data on state unemployment rates are derived from the Department of Labor at: <http://www.bls.gov/lau/home.htm>. MSA house price appreciation rates are derived from the Office of Federal Housing Enterprise Oversight (OFHEO) at: <http://www.ofheo.gov/HPI.asp>.

<sup>16</sup> For example, as Model 5 shows, the value of the location parameter [ $\gamma_{jm}$  in Equation (2)] for the outcome of curing is 13.17 and significant at the 0.01 level, greater than the value of the location parameter in Group 2 (0.89), and also larger than the constant of Model 4 (3.84) when unobserved heterogeneity is not considered (treated as a group). So, Group 1 has a larger probability of curing than Group 2.

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