Geographic Variation in Subprime Loan Features, Foreclosures and Prepayments

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March 2011

Abstract

Using data on subprime mortgages from ten cities, I examine geographic variation in the effects of prepayment penalties, balloon loans, and reduced documentation on the probabilities of foreclosure and prepayment. Results indicate that across cities, reduced documentation is consistently related to higher probabilities of foreclosure, and prepayment penalties are consistently related to lower probabilities of prepayment. Prepayment penalties and balloon loans are more sporadically associated with foreclosures, and reduced documentation and balloon loans are more sporadically associated with prepayments. These results are robust to controls for several state anti-predatory lending law provisions, whose effects are also tested.

EconLit subject descriptors: G210, G280, C520, H770

Key words: foreclosure; prepayment; subprime mortgages; financial regulation; unobserved heterogeneity

I am grateful for helpful advice, comments, and information from Eliana Balla, Souphala Chomsisengphet, Kathleen Engel, Randy Hirscher, David Nebhut, two anonymous referees, and seminar participants at the Federal Reserve Bank of Richmond, the Office of the Comptroller of the Currency (OCC), and the annual meetings of the Financial Management Association, Southern Finance Association, and Eastern Finance Association. The views expressed herein do not reflect those of the OCC or the Department of the Treasury. All errors are my own.

1. Introduction

One frequently offered explanation for the rise in foreclosures beginning in 2007 is a proliferation of a variety of subprime loans with features that, it is argued, are unfair to borrowers and make foreclosure more likely. In 2010, the Dodd-Frank Wall Street Reform and Consumer Protection Act placed new restrictions (discussed below) on the use of certain of these loan features. While the crisis is a national one, residential housing markets are segmented by their nature – for most people, a house in Saint Petersburg is not a close substitute for an identical house in Saint Louis – and the effects of a given loan feature in one locale need not be the same in another locale. The main goal of this paper is to use loan-level data from ten American metropolitan statistical areas (MSAs) to evaluate how consistent the effects of certain loan features are on foreclosures and prepayments across MSAs.

This paper examines the effects of three subprime loan features: prepayment penalties, balloon payments, and reduced documentation. A prepayment penalty requires a borrower to pay a fee if he or she repays a loan within a pre-specified length of time after origination. A balloon loan is one that does not fully amortize over the term of the loan, and so requires a large "balloon" payment at maturity. Reduced documentation refers to loans that are underwritten with key economic information about the borrower either self-reported by the borrower or omitted entirely.

These features, among others, are frequently labeled "predatory," meaning that unscrupulous lenders can use them to place borrowers in loans that the borrowers cannot afford or whose terms the borrowers do not fully understand, or to extract large fees from borrowers. A prepayment penalty directly raises the cost of repaying a loan through a refinancing or sale. With a prepayment penalty in effect, a financially distressed borrower having difficulty with his

or her mortgage payment may find prepayment prohibitively expensive, making a foreclosure more likely. The final payment of a balloon loan is usually far too large for a borrower to pay out of pocket, requiring a prepayment via a potentially costly refinancing or the sale of the property to meet the loan terms. Reduced documentation fosters ambiguity in a borrower's ability to repay a loan, and can be used to place a borrower into a more expensive loan than the borrower can afford.

Each of these features can also bring substantial benefits to borrowers. Because a prepayment penalty transfers some of the prepayment risk from the lender to the borrower, a loan with a prepayment penalty usually features a lower interest rate than an otherwise similar loan, making the loan more affordable. Similarly, a balloon loan will have lower monthly payments than a fully-amortizing one, making it more attractive for a borrower who places a high probability on either selling the house or refinancing the loan prior to the scheduled balloon payment. In both cases, the greater affordability associated with these two loan features can be the difference between being able or unable to purchase a home for some borrowers. Reduced documentation can be useful for people with incomes that are highly variable or otherwise difficult to document, and who might be shut out of the housing credit market if full documentation were required.

These three loan features have been the subject of both longstanding and recent federal-level regulation. Since 1994, the Home Ownership and Equity Protection Act (HOEPA) has restricted many lending practices for "high-cost loans," including a prohibition against prepayment penalties imposed beyond the fifth year after a loan's origination, and a prohibition against balloon loans in which the final payment is due within five years of origination.[1] In 2008, Federal Reserve Board's amendment to Regulation Z banned prepayment penalties on

"higher-priced mortgage loans" in which the monthly payment can change in the first four years of the loan, and limited prepayment penalties to the first two years of other higher-priced loans.[2] The rule change also prohibits lenders from making a higher-priced loan without regard to a borrower's ability to repay based on the borrower's income and assets, and requires lenders to verify all income and assets on which the lender relies to determine the ability to repay. Title XIV of the Dodd-Frank Act prohibits prepayment penalties entirely on all ARMs and certain high-priced FRMs. On all other mortgages, prepayment penalties are prohibited three years after origination, while the amount of the penalty in the first, second, and third year after origination is limited to 3 percent, 2 percent, and 1 percent, respectively, of the outstanding loan balance. Title XIV requires originators to verify a borrower's ability to repay based on a payment schedule that fully amortizes the loan over the loan term, and sets standards for the verification of borrower income or assets. Title XIV also prohibits balloon payments on high-priced mortgages.

The implicit rationale for specifically federal-level regulation (rather than regulation at a lower level or no regulation) of these loan features rests on three premises: (1) there are negative externalities associated with foreclosures, (2) the negative effects of the restricted loan features (including greater probabilities of foreclosure, extraction of fees, costly refinancings and house sales that might otherwise have been unnecessary) outweigh the positive effects (including lower monthly payments and greater access to credit for lower income borrowers), and (3) the effects are on net consistently negative in mortgage markets across the country. The first premise justifies government regulation in mortgage lending in general, and the second premise justifies regulation of specific loan features. The third premise is necessary to justify regulatory decision-making at the federal level, as opposed to the state or municipal level. Because real estate markets are geographically segmented, mortgage lending practices may develop differently in

different markets. Differences in the prevalence of brokers versus bank originators, standards set by different locally dominant lenders, the industry mix (affecting workers' income levels and stabilities), and prior state and local lending laws can all influence how and how often various loan features are used from one market to the next. If the effects of a given feature are on net negative in some markets but positive in others, then federal-level regulation is sub-optimal compared to an approach in which the presence or restrictiveness of regulation concerning a particular loan feature is determined at lower governmental levels.

The following section provides an overview of the literature relevant to the first two premises. This paper contributes to the existing literature examining the validity of the second premise, but more importantly it is the first paper (to my knowledge) to address the third premise, and so makes a significant contribution to the subprime lending literature. It does so by evaluating the relationships between prepayment penalties, balloon loans, and reduced documentation on the one hand and the probabilities of foreclosure and prepayment on the other for ten MSAs, and analyzing how consistent those relationships are across MSAs. The findings indicate that reduced documentation is consistently related to greater probabilities of foreclosure, and prepayment penalties are consistently related to lower probabilities of prepayment. Prepayment penalties and balloon loans are more sporadically associated with foreclosures, and reduced documentation and balloon loans are more sporadically associated with prepayments. The results also generally show greater cross-MSA variation in these relationships for fixed-rate mortgages (FRMs) than for adjustable-rate mortgages (ARMs), and for home purchase mortgages than for refinance mortgages.

As indicated above, there is more to consider in the total positive and negative effects of a loan feature than changes in the probabilities of different loan outcomes, important though

those are. Increased access to credit, financial gains from lower monthly payments, and financial losses from fees, refinancing, or forced home sales are all potential additional effects attributable to the examined loan features, but are not addressed here. As such, this paper's findings provide a useful first step in evaluating the geographic variation in the total effects of subprime loan features, but not a complete or definitive answer.

Given that a major potential source for variation in the relationships described above is variation in state anti-predatory lending laws (APLs), I incorporate the effects of a variety of state APL provisions on the probabilities of foreclosure and prepayment. Although a thorough examination of the efficacy of state APLs is outside the scope of this paper, the results indicate that in general, several of the specific state APL provisions tested are negatively related to the probability of foreclosure and positively related to the probability of prepayment. There is very little previous research on the relationship between state APLs and loan outcomes, so these findings represent another contribution to the literature on subprime mortgage lending. More relevant to the main goal of this paper, the cross-MSA variation in the relationships between the examined loan features and the probabilities of foreclosure and prepayment is robust to the inclusion of state APL provisions in the analysis.

The remainder of this paper is structured as follows. Section 2 discusses the relevant previous literature. Section 3 describes the paper's data sources and the econometric methodology employed. Section 4 presents results from the empirical analysis, and Section 5 concludes.

2. Previous Literature

The primary negative externality associated with foreclosures in the academic literature is a contagion effect in which foreclosures cause nearby house prices to fall. In recent research, Immergluck and Smith (2006), Lin *et al.* (2009), and Harding *et al.* (2009) all identify a reduction in prices for homes near foreclosed properties. Because causality could run the other way, with general declines in local house values triggering foreclosures in some neighborhood homes, Harding *et al.* (2009) simultaneously estimate local house price trends and the price impact of nearby foreclosures and still find a significant contagion effect.

The years leading up to and following the subprime foreclosure crisis have witnessed a number of papers examining the relationships between prepayment penalties, balloon loans, or reduced documentation and the probability of default in subprime mortgages, with default variously defined as a loan being sixty days delinquent, ninety days delinquent, or entering foreclosure or "Real Estate Owned" (REO) status. Quercia *et al.* (2007), Danis and Pennington-Cross (2008), Rose (2008), Demyanyk and Van Hemert (2009), and Pennington-Cross and Ho (2010) all find that prepayment penalties are associated with greater probabilities of default, although in Rose (2008) and Pennington-Cross and Ho (2010) this result is somewhat dependent on the specification and type of loan used. All of the above papers except Demyanyk and Van Hemert (2009) use competing risk models that jointly consider the probabilities of prepayment and default, and they all find a negative relationship between prepayment penalties and the probability of prepayment, as one would expect. These papers generally also find that reduced documentation is associated with greater probabilities of default, with inconsistent results regarding the probability of prepayment. Two additional papers focusing specifically on reduced documentation, Jiang *et al.* (2009) and LaCour-Little and Yang (2010), find that it is associated with greater default risk, and present evidence that the increased default risk is associated with

income exaggeration or other falsification of borrower information. Balloon loans have received less attention than the other loan features. Quercia *et al.* (2007) find balloon loans to be associated with greater probabilities of foreclosure and prepayment in a sample of purchase FRMs and ARMs. Rose (2008) finds a positive relationship with the probability of foreclosure for refinance FRMs but not purchase FRMs, and finds that balloon loans are negatively associated with the probability of prepayment for purchase FRMs but not refinance FRMs.

Prepayment penalties have received additional attention from researchers analyzing their potential benefits and costs to borrowers beyond their effects on the probabilities of foreclosure and prepayment. Elliehausen *et al.* (2008), using a simultaneous equation approach controlling for endogeneity among loan interest rates, loan-to-value (LTV) ratios and prepayment penalties, find that prepayment penalties are associated with lower interest rates and that state laws restricting prepayment penalties are associated with higher interest rates. Rose (2011) uses a similar approach and finds that prepayment penalties are generally associated with lower initial loan interest rates, but are associated with significantly higher ARM interest rate margins. LaCour-Little and Holmes (2008) compare the benefit to borrowers of reduced interest rates to the costs based on the probability of prepayment and the size of the prepayment penalty under various scenarios, and find that the expected benefits are not enough to outweigh the expected costs. The results of a theoretical model and empirical analysis by Mayer *et al.* (2010) suggest that the least credit-worthy borrowers receive the largest benefits from prepayment penalties in the form of lower interest rates that both reduce the likelihood of default and allow access to residential credit that would otherwise be unavailable.

Existing studies of the regulation of subprime lending through state and municipal APLs mostly focus on the impact of such laws on the volume of subprime lending and on loan interest

rates. Harvey and Nigro (2003) investigate loan volumes following the enactment of an APL in Chicago, and Quercia *et al.* (2004) and Harvey and Nigro (2004) both examine the effects of a North Carolina APL. Taken together, these studies suggest that those APLs did not substantially reduce subprime lending in the affected locales, with such reductions that did occur being attributable to a decline in loans with features, like prepayment penalties and balloon loans, which were targets of the legislation. Subsequent studies on state APLs develop joint measures or indices of the strength of various common APL provisions to test the impacts of different states' APLs. Pennington-Cross and Ho (2006) find that state APLs with more restrictions on specific loan features reduce the probability of origination, while APLs that cover a broader range of loans increase that probability. Bostic *et al.* (2008) find similar results, and also find that an index of the enforcement provisions in state APLs is not consistently associated with the volume of subprime lending. Rather than create state law indices, Li and Ernst (2007) create dummy variables for each unique combination of provisions found in state APLs, and find that APLs generally reduce the frequency of loans with targeted loan features but do not reduce subprime lending overall. They also find that for FRMs, state APLs are associated with modest decreases in subprime interest rates. This contrasts with Pennington-Cross and Ho (2008), who find state APLs are associated with slightly higher interest rates for FRMs and slightly lower ones for ARMs. A research report by Ding *et al.* (2010) is the only previous paper to test the impact of state APLs on loan outcomes. Using a pooled sample of prime and subprime loans, they find lower probabilities of delinquency and prepayment associated with state APLs that have broader coverage of loans (based on loan points and fees), more restrictions on prepayment penalties, and requirements that lenders verify borrowers' abilities to repay loans.

The present paper extends this literature on several fronts. Most importantly, it is the first to examine geographic variation in the relationships between the subprime loan features and the probabilities of foreclosure and prepayment. As discussed earlier, this has clear implications for the optimality of federal-level regulation of subprime lending. The results here showing significant differences in those relationships across MSAs also suggests that the results of previous papers based on nationwide samples may mask considerable geographic heterogeneity. This paper conducts loan-level multivariate analysis using 2002-2006 subprime originations, more recent data than the papers cited above. The sample periods of most of the above papers do not extend beyond 2004, implying that their samples do not reflect subprime originations from the years immediately preceding the mortgage crisis. Exceptions include Pennington-Cross and Ho (2008 and 2010), a large portion of whose 1998-2005 sample period substantially predates the mortgage crisis, Ding *et al.* (2009), who pool prime and subprime loans, Demyanyk and Van Hemert (2009), who do not account for the competing risks of default and prepayment, and Jiang *et al.* (2009), who both pool prime and subprime loans and do not account for competing risks. The present paper is also only the second to examine the impact of state APLs on loan outcomes, and is the first to do so for several types of APL law provisions and for subprime loans exclusively.

3. Data and Methodology

The dataset for this paper is from First American CoreLogic LoanPerformance (henceforth LoanPerformance), and consists of monthly loan-level data on purchase and refinance mortgages for owner-occupied single family residences originated during 2002-2006 and followed through October 2008.[3] These are loans that have been packaged into private-label

mortgage-backed securities, and include loans from both the higher cost (B and C grade) and near prime (Alt-A grade) segments of subprime. The data covers ten MSAs, listed in Table 1. The selection of these MSAs was based on a report from RealtyTrac, Inc. (2008), providing 2007 foreclosure rates for the hundred largest metropolitan areas in the United States. To ensure that the sample MSAs represent both a substantial number of American households and a diverse range of mortgage market difficulties, I divided the MSAs with populations over one million inhabitants into deciles based on the reported foreclosure rates. From each decile I selected the MSA with the highest population, with the condition that only one MSA from any given state be included to ensure geographic diversity.[4] For specifications that pool loans from all ten MSAs, random samples of each MSA's loans were taken to make the analyses computationally more tractable.[5]

There are few or no ARMs featuring balloon payments for most selected MSAs until 2005, so all balloon ARMs are dropped from the sample to avoid distortions. To simplify the construction of ARM-specific variables, the sample ARMs are limited to those for which the interest rates adjust every six months, with the first scheduled rate adjustment occurring in the twenty-fourth or thirty-six month after origination and the interest rate indexed to the six-month London Interbank Offered Rate (84 percent of the total ARM sample). FRMs are limited to loans with terms of fifteen or thirty years (96 percent of the total FRM sample) to ensure that FRM-specific variables are constructed using market FRM rates of the appropriate maturities.

The LoanPerformance data contains loan-level information including loan type (FRM or ARM), purpose (purchase or refinance), origination date, dates when a loan is prepaid, enters REO status, or a foreclosure process is initiated, the loan interest rate, LTV, and borrower FICO score at origination, whether the borrower withdrew cash out (for refinances), whether the loan

was based on low- or no-documentation, the length of the prepayment penalty period (if any), and whether the loan required a balloon payment. This data was merged with quarterly MSA-level home price index values from Freddie Mac's conventional mortgage home price indices, monthly MSA-level unemployment rates from the Bureau of Labor Statistics, monthly FRM and ARM interest rates from Freddie Mac's Primary Mortgage Market Survey, and information on state foreclosure laws from Ghent and Kudlyak (2010).

Variables used in this paper are defined in Table 2, with summary statistics presented in Table 3. Here and throughout the paper, loans are divided into four categories by loan type and purpose. *PrepayPen* indicates whether a prepayment penalty is in effect for a loan in a given month, and *PrepayPenEnd* indicates loans in the month that a prepayment penalty period ends and the two following months. If prepayment penalties are binding constraints on prepayment, one would expect the probability of prepayment to increase sharply but temporarily immediately after the penalty period ends. *Balloon* and *LowNoDoc* indicate loans that require a balloon payment and that were originated based on reduced documentation, respectively.

FICO measures the borrower's credit score at origination, which should be negatively related to defaults. *CLTV* is an estimate of the borrower's equity in the home in the current month. Low or negative equity (implying a high value of *CLTV*) is expected to increase the probability of foreclosure as the option to default is more valuable to the borrower, while greater equity (lower *CLTV*) should increase the probability of prepayment as borrowers with significant equity find it easier to refinance their loans and can extract or "cash out" some of their equity through refinancing. *Cashout* indicates such a cashout refinancing. The expected relationship between it and foreclosure is ambiguous – extracting home equity can result in higher monthly payments, but a recent cashout suggests greater borrower liquidity, at least in the short term. The

expected relationship between *Cashout* and prepayment is expected to be positive, as borrowers with the demonstrated understanding and willingness to refinance once are plausibly more likely to refinance again. Following Calhoun and Deng (2002), *RelLoanSize* is included on the premise that loan size may be correlated to borrower income or wealth, and so can indicate protection against financial distress. *RelLoanSize* is expected to be negatively related to foreclosure and positively related to prepayment (as qualifying for a refinancing becomes more likely). *ChgUnempl* measures the likelihood of an event causing financial distress, and so is expected to be positively related to foreclosures and negatively related prepayments. *VarHPI* captures volatility in house prices, with option theory suggesting that greater volatility makes borrowers likely to delay defaulting in case the option to default becomes more valuable. *Judicial* indicates whether state law requires lenders to go through a judicial foreclosure process rather than a quicker non-judicial process, and so *Judicial* should be associated with a lesser probability of foreclosure. Specifications also include origination year and MSA indicator variables.

While the above variables are used for all specifications, following Pennington-Cross and Ho (2010) some variables are used exclusively in FRM or ARM specifications in recognition of the differences between the loan types. FRM specifications include *RefiPremium*, which uses the spread between the loan interest rate and the current market FRM rate, divided by the loan interest rate, as a proxy for the potential benefit to the borrower of refinancing, and as such should be positively related to prepayments.[6] *VarFixed* captures the volatility of FRM mortgage rates, with option theory suggesting that greater volatility makes borrowers likely to delay prepaying in case the option to refinance becomes more valuable.

The ARM-specific variables are based on those used by Ambrose *et al.* (2005) and Pennington-Cross and Ho (2010). *PaymentAdj* measures the increase in monthly payment at a

loan's most recent rate reset, and should be positively associated with foreclosures and prepayments.[7] *Adj1st* indicates the month of a loan's first scheduled rate reset and the following two months, with the expectation that there should be a spike in foreclosures and prepayments during that window. *PostAdj1st* indicates all months following the *Adj1st* window to distinguish this period from the months before the first scheduled rate reset. *Spread* has a purpose analogous to *RefiPremium*, proxying for the potential benefit to a borrower of refinancing into a FRM, and *VarLIBOR* is the ARM analogue to *VarFixed*.

The empirical analysis employs a multinomial logit (MNL) model developed by Clapp *et al.* (2006) which incorporates unobserved heterogeneity by modeling individual borrowers as coming from a finite number of discrete groups with unobserved characteristics.[8] The presented results assume that borrowers are distributed across two discrete groups.[9] The model estimates the relative weight and a separate intercept term for each group, but does not assign each observation to a group. The data is structured in event history format, with each observation representing one month in which a loan remains active. In each month, a loan remains active, is prepaid, or first enters foreclosure (which here includes entering REO status).[10] A loan drops out of the sample after a first foreclosure start or prepayment. The model directly controls for the competing risks of foreclosure and prepayment by requiring that the probabilities of all three outcomes sum to one. Standard errors are clustered by loan.

The MNL model with unobserved heterogeneity is econometrically preferable to the standard MNL model, which assumes there is no unobserved heterogeneity across observations, but the unobserved heterogeneity model is also vastly more time-intensive and is more prone to convergence problems.[11] Convergence problems did not arise for specifications that pooled loans from all ten MSAs (Tables 4, 8, and 11), but did in specifications analyzing each MSA

individually (Tables 6a-6b). For each MSA specification that did not converge, I employ a constant heterogeneity weight approach in which I performed ten additional specifications for that MSA, the first constraining the groups' relative weights to be 50%-50%, the second constraining them to be 55%-45%, and so on through 95%-5%. From those ten specifications, Tables 6a-6b presents results from the one that successfully converged with the greatest log-likelihood value.[12]

MNL models also assume that the odds ratio between any two outcomes is independent of any other possible outcomes. An alternative, the proportional hazard model, estimates the effects of explanatory variables on survival times without requiring assumptions about the underlying hazard function, but does assume that given two observations with different explanatory variable values, the ratio of the observations' hazard functions does not depend on time. As a robustness check, the analyses were also performed using a standard MNL model and a proportional hazard model, with similar results.[13]

4. Empirical Analysis

The evidence presented in this section supports the following conclusions: (1) reduced documentation is consistently associated with a greater probability of foreclosure across the sample MSAs, (2) prepayment penalties are consistently associated with a lesser probability of prepayment across MSAs, and (3) other relationships among prepayment penalties, balloon loans, and reduced documentation are more sporadic across MSAs.

4.1 All 10 MSAs Pooled

Before examining geographic variation across MSAs, I first present in Table 4 results for loans from all ten sample MSAs pooled. *PrepayPen* is associated with a 13-15 percent reduction in the probability of foreclosure for FRMs and a 38-42 percent reduction in the probability of foreclosure for ARMs.[14] This contrasts with previous studies (see Section 2), which generally find prepayment penalties to be positively associated with foreclosures. This discrepancy may be explained through the finding of Mayer *et al.* (2010) that the benefits of prepayment penalties are greatest for the riskiest borrowers, the finding of Demyanyk and Van Hemert (2008) that subprime loan quality deteriorated in the years leading up to the mortgage crisis, and the fact that my sample includes more loans from later years than the samples of the previous literature. In other words, for the less creditworthy borrowers who entered the subprime market in large numbers leading up to the crisis, the reduction in loan interest rates associated with prepayment penalties appears to have reduced the probability of foreclosure more than the penalty for prepayment itself increased the probability of foreclosure. *PrepayPen* is associated with lesser probabilities of prepayment across all specifications, and *PrepayPenEnd* indicates a spike in prepayments immediately following the expiration of penalty periods. Balloon loans are associated with 24 and 9 percent reduction in the probability of prepayment for purchase and refinance FRMs respectively, and are associated with a 29 percent greater probability of foreclosure for refinance FRMs.[15] Given that the balloon payments on sample loans are generally not due until some years after the sample period ends, the reason for the foreclosure result is not clear. *LowNoDoc* is associated with a 51-77 percent increase in the probability of foreclosure across all categories, and is associated with slight increase in the probability of prepayment for purchase loans but not for refinance loans.

The results for the control variables are generally in line with expectations, so only exceptions are discussed here. *RelLoanSize* is positively related to the probability of foreclosure, the opposite of expectations. Rather than capturing borrower income or wealth, the variable may be proxying for borrowers with loans that are large relative to their incomes, with less affordable payments driving increased probabilities of foreclosure and prepayment.[16] *VarHPI* is positively related to prepayments, which is consistent with most of the variation in house price indices during the sample period being driven by rapidly rising house prices. *VarFixed* is weakly positively related to prepayments, but only for refinance FRMs.

Constant1 and *Constant2* are the intercept terms associated with the two groups based on unobserved heterogeneity. *Constant1* is consistently less than *Constant2*, implying that the first group is the "safer" group, on average having lower probabilities of both foreclosure and prepayment. *Prob. Coeff.* is a coefficient based on the estimate of the relative sizes of the two groups, and *Probabillity1* provides the corresponding percentage of borrowers estimated to be in the first group.[17] Results indicate that for all loan categories, the first group is far larger than the second, "riskier" group.

4.2 Non-parametric Tests for Differences across MSAs

T-test results (not shown for brevity) indicate significant (usually at the 0.1 percent level) differences for each variable across the overwhelming majority of the 45 possible MSA pairs, an indication of variation across subprime mortgage markets. Further evidence of cross-market variation is presented in Table 5. Each number represents the χ^2 statistic from a non-parametric Wilcoxon test for the equality of survival curves for loans originated in two different MSAs.[18]

The results show widespread and highly significant differences. This is ample evidence to warrant multivariate analysis of cross-MSA differences.

4.3 MSA-by-MSA Analysis

Table 6a (FRMs) and Table 6b (ARMs) present results for each MSA separately. Specifications are the same as in Table 4 except *Judicial* and the MSA indicators are necessarily dropped. Estimates for control variables are consistent with those in Table 4, and are omitted here for brevity.[19] Consistent with Table 4, *PrepayPen* is negatively related to the probability of prepayment in all forty specifications, *LowNoDoc* is positively related to the probability of foreclosure in all but three cases, and other relationships between loan features and outcomes are more sporadic. *PrepayPen* is not significantly related to the probability of foreclosure in half of the FRM specifications, although it is almost always negatively related to the probability of foreclosure in ARMs. In the prepayment equation results, the coefficient estimates for *LowNoDoc* are almost evenly split among positively significant, negatively significant, and not significant. *Balloon* is mostly not significant, but does show some generally positive associations with foreclosures and negative associations with prepayments.

Differences across MSAs in coefficient estimates for *PrepayPen*, *Balloon*, and *LowNoDoc* are summarized in Tables 7a-7b. The listed pairs of MSAs are those for which the coefficient estimates of a given loan feature have opposite signs and are different at the ten percent significance level, based on a test statistic $(b_1 - b_2)/(se_1^2 + se_2^2)^{1/2}$ where b_i and se_i are the loan feature's coefficient estimate and standard error from the regression for MSA_i. These are cases in which an identical restriction of the loan feature across both MSAs is likely to cause opposite responses in the probability of foreclosure or prepayment, suggesting unintended

adverse consequences in at least one of the markets through the elimination of contractual options that some borrowers and lenders may find beneficial. With ten sample MSAs, there are 45 possible MSA pairs and a maximum of 25 pairs with statistically significant opposite-sign differences.

Table 7a, summarizing foreclosure equation estimates, shows that with the exception of those involving Miami purchase FRMs (the only negative coefficient for *LowNoDoc* in the foreclosure equation for any MSA or category, and not itself significant), there are no significant opposite-sign differences associated with *LowNoDoc*. There are a substantial number of significant opposite-sign differences involving *Balloon* and *PrepayPen*, although for *PrepayPen* the listed differences are all for FRMs with the exception of those involving Pittsburgh purchase ARMs. Table 7b, summarizing prepayment equation estimates, shows nearly the reverse – no significant opposite-sign differences associated with *PrepayPen* or *Balloon*, and very large numbers of significant opposite-sign differences for *LowNoDoc*.

4.4 MSA-Loan Feature Interactions

Table 8 provides results from specifications that explicitly model the interactive effect of a given loan feature in a given MSA. Each specification includes the variables from the Table 4 specifications as well as interaction terms for the MSA indicators and each of *PrepayPen*, *PrepayPenEnd*, *Balloon*, and *LowNoDoc*. Coefficient estimates for the control variables are similar to those in Table 4, and are omitted from Table 8 for brevity.

PrepayPen is associated with a 29 percent increase in the probability of foreclosure for refinance FRMs, with no significant association for purchase FRMs. This suggests that for FRMs, once the MSA-specific impacts are controlled for, the general impact of prepayment

penalties on foreclosures is more positive than Table 4 indicates. In contrast, for ARMs *PrepayPen* is associated with a 63-77 percent reduction in the probability of foreclosure, a more dramatic reduction than shown in Table 4. *PrepayPen* remains negatively associated with the probability of prepayment across all loan categories. *Balloon* and *LowNoDoc* are associated with a 91-124 percent and a 24-99 percent increase in the probability of foreclosure, respectively. Neither *Balloon* nor *LowNoDoc* are significantly associated with the probability of prepayment.

The number of MSA-loan feature interaction terms that are statistically significant varies by loan category and loan feature, with no obvious pattern across MSAs. More relevant to the question of geographic variation in the loan features' impacts is whether the MSA-loan feature interaction terms are significantly different from each other, rather than from zero. Similar to Tables 7a-7b, Tables 9a-9b list the pairs of MSAs for which the combined impact of the loan feature variable and the MSA-loan feature interaction term have opposite signs and are significantly different at the ten percent level based on Wald tests.[20] The results are not identical between Tables 7a-7b and Tables 9a-9b, but there are clear similarities. There are no significant opposite-sign differences for *LowNoDoc* in relation to foreclosures or for *PrepayPen* in relation to prepayments. There is roughly the same number of cross-MSA differences in relation to foreclosures associated with *Balloon* and *PrepayPen*, although in Table 9a they are more concentrated among purchase FRMs and there are no cross-MSA differences for *PrepayPen* among ARMs. Table 9b has somewhat fewer cross-MSA differences for *LowNoDoc* and more for *Balloon* than Table 7b.

4.5 State Anti-predatory Lending Law Provisions

State APLs that restrict the use of prepayment penalties, balloon loans, or reduced documentation in varying degrees are a potential source of the cross-MSA differences identified above. To determine the extent to which this may be so, I conducted an examination of each sample state's lending legislation and regulations with respect to ten provisions often addressed in state APLs. For each one, I construct an indicator variable equaling one if, in a given month, the state in question had an APL provision in effect that was more restrictive on lending terms than the comparable provision in HOEPA. Given that HOEPA applies to mortgage lending nationwide, only an APL provision stricter than HOEPA should have a state-specific effect. Most of the sample states enacted or amended their APLs during the sample period, assisting with identification.

The APL variables are defined in Table 10. *TriggerAPR* and *TriggerPF* measure whether the high-cost thresholds of a state's APL are lower than HOEPA's thresholds, and so affect the range of loans to which the other provisions in the APLs apply. *FinancingPF* identifies limits on the points and fees that may be financed on high-cost loans. Because they affect the incentives of lenders to originate high-cost loans, those three APL variables could plausibly affect the impacts of any of the three loan features. *PrepayDur*, *PrepayAmt*, and *PrepayNoPre* address specific restrictions on the use of prepayment penalties, and *BalloonTerm* and *Verification* address the use of balloon loans and reduced documentation, respectively. *FlippingDur* and *OwnRefiPF* concern restrictions on refinancing high-cost loans. Because prepayment penalties discourage borrowers from refinancing and impending balloon payments encourage borrowers to refinance, restrictions on refinancing could affect the impacts of *PrepayPen* and *Balloon*. HOEPA and some state APLs cover refinance loans but not home purchase loans, while other

state APLs cover loans with either purpose. A state's APL variables can take different values for purchase versus refinance specifications, reflecting this difference in state APL coverage.

A benefit of simplistic measures like these relative to the indices created by Pennington-Cross and Ho (2006) and Bostic *et al.* (2008) is that these measures remove the need to make assumptions about the comparative strength of alternative provisions. (For example, should a prohibition against balloon payments due within 15 years of origination be measured as 50 percent more restrictive than a prohibition within 10 years? 100 percent?) The related cost is that potentially useful variation in state APLs is lost. (The 15-year prohibition is very likely more restrictive to some degree.) Because the primary aim here is not to evaluate specific APL provisions but instead to control for them in examining geographic variation in the effects of *PrepayPen*, *Balloon*, and *LowNoDoc*, I construct simple APL measures rather than develop a full set of assumptions for indexing the provisions. There are strong correlations among the state APL variables, so they are introduced into the specifications one at a time.

Tables 11a-11d present results of specifications as in Table 8 with the addition of state APL variables by themselves and interacted with each of the relevant loan feature variables. Results for the control variables are similar to those in Table 4, and are omitted here for brevity. Even so, there remains a great deal of information in Tables 11a-11d that is discussed only briefly here. In a slim majority of cases the APL provisions are not significantly related to the probability of foreclosure, although they are negatively related in a substantial minority of specifications. There is more variation in the relationships between the APL variables and the probability of prepayment, but for most APL variables the relationships are more often positive than negative. These results are broadly consistent with the state APL provisions reducing both foreclosures and impediments to prepayment.

The interaction terms of APL provisions and *PrepayPen* are always positively related to the probability of prepayment for *PrepayDur*, *PrepayAmt*, *TriggerPF*, and *FlippingDur*, suggesting that when these provisions are stronger, prepayment penalties are less binding constraints on prepayment. Findings for APL interactions with *PrepayPen* are not as consistent with respect to the probability of foreclosure, with generally positive results for FRMs, occasionally positive results for purchase ARMs, and negative results for refinance ARMs. Under stricter APLs, the freedom of borrowers and lenders to adopt prepayment penalties in exchange for lower loan interest rates may be restricted, reducing affordability and making foreclosures more likely. At the same time, stricter APLs may make refinancing more available to distressed borrowers who took out loans with prepayment penalties, thereby making foreclosures less likely. Because initial loan interest rates are on average highest for FRMs, lower for purchase ARMs, and lowest for refinance ARMs, the former effect of stricter APLs is plausibly most dominant for FRMs and the latter effect most dominant for refinance ARMs.[21] APL interactions with *Balloon* and with *LowNoDoc* are significant much less often than the interactions with *PrepayPen*.[22]

There are endogeneity concerns associated with the APL provision results in Tables 11a-11d. Using the sum of a state's values for the ten APL provision variables as an extremely crude measure of the overall restrictiveness of the state APL, and using average annual state subprime foreclosure rates over 1998-2001 from Haver Analytics to measure pre-sample foreclosure rates, I find a strong negative correlation between pre-sample foreclosure rates and APL restrictiveness at the start of the sample period, and a strong positive correlation between pre-sample foreclosure rates and the adoption of strict APL provisions during the sample period. In addition, *Judicial* is correlated with most of the APL provision variables, especially for purchase

loans, suggesting a relationship between state foreclosure law and anti-predatory lending law that could bias the results.[23] A more thorough investigation of the effects of APL provisions on loan outcomes would need to address these concerns, but such analysis is beyond the scope of this paper.

Tables 12a-12b uses the APL provision results to address the primary focus here, the geographic variation in the loan features' effects on the probabilities and foreclosure and prepayment. For each specification in Tables 11a-11d, the number of significant opposite-sign cross-MSA differences (defined as in Tables 9a-9b) is shown in Tables 12a-12b. The less variation there is in the number of cross-MSA differences across the APL provision specifications (i.e., the less the numbers in a given column change), the less likely it is that differences in state APL provisions explain the geographic variation in the effects of the loan features on loan outcomes identified in Tables 9a-9b.

Starting with Table 12a, pertaining to results regarding the probability of foreclosure, there is a consistent pattern of changes in the number of cross-MSA differences in the MSA**PrepayPen* interaction terms when an APL provision is also interacted with *PrepayPen*. This usually results in less geographic variation for FRMs, but more for ARMs. If the two effects driving the APL**PrepayPen* results described above are accurate, then the reduction of geographic variation for FRMs suggests that the use of prepayment penalties to increase affordability can be circumscribed by stricter APLs, and so including APL**PrepayPen* interaction terms controls for one source of the identified cross-MSA variation in prepayment penalties' effects on foreclosures. At the same time, including APL**PrepayPen* terms for ARMs may primarily control for a geographically consistent reduction in foreclosures due to an increased availability of refinancing, allowing for the greater identification of underlying cross-

MSA variation in prepayment penalties' effects on foreclosures. Cross-MSA variation in the effects of balloon loans is largely stable, and there are no changes at all in the number of cross-MSA differences in the MSA**LowNoDoc* interaction terms. Thus there is little evidence that state APL provisions explain the geographic variation (or lack thereof) in the effects of balloon loans or reduced documentation identified in Table 9a. State APL provisions do explain a portion of the geographic variation associated with *PrepayPen* and foreclosures, but substantial variation remains even after controlling for APL provisions.

In Table 12b, pertaining to results regarding the probability of prepayment, almost all of the substantial changes in the numbers of cross-MSA differences occur for purchase FRMs. Only in the purchase FRM specification with *PrepayNoPre*PrepayPen* is the coefficient estimate for *PrepayPen* greater than zero (but not significant). The number of cross-MSA differences associated with MSA**Balloon* often falls, frequently to zero, when APL provisions are interacted with *Balloon*, suggesting that differences in state APLs may explain a substantial portion of the geographic variation in the effects of balloon purchase FRMs on the probability of prepayment. For refinance FRMs, purchase ARMs, and refinance ARMs, the introduction of APL provisions into the specifications has little appreciable effect on the geographic variation in the impacts of prepayment penalties, balloon loans, or reduced documentation.

4.6 Robustness Checks

Several alternative specifications were tested to check the robustness of the geographic variation results. The definition of foreclosure used above, a loan first entering a foreclosure process or REO status, does not take into account that some loans entering the foreclosure process are resolved prior to a foreclosure being completed. I used two alternative definitions: a

first foreclosure start or entrance into REO status that ultimately results in a completed foreclosure (so that a loan entering a foreclosure process or REO status that does not result in a foreclosure is considered an active loan), and the completion of a foreclosure. Under these definitions, the number of cross-MSA differences associated with *PrepayPen* and foreclosures was smaller for FRMs and larger for ARMs, but otherwise the pattern of results was the same.

Because *PrepayPenEnd* is clearly related to *PrepayPen*, the inclusion of *PrepayPenEnd* could plausibly affect the *PrepayPen* results. In specifications in which *PrepayPenEnd* was omitted, the coefficient estimates for *PrepayPen* were affected, particularly in the prepayment equation results, but the findings concerning geographic variation were not substantially different. Due to the potential for state foreclosure laws to influence both foreclosure rates and the effects of state APLs, alternative treatments of state foreclosure laws were used. In addition to *Judicial*, I used an indicator variable equaling one if a state's laws allow lenders to obtain a deficiency judgment against borrowers when the proceeds from a foreclosure sale do not cover the mortgage debt owed (see Ghent and Kudlyak, 2010). Inclusion or exclusion of these variables affects the coefficient estimates of the MSA indicators, but the results regarding the impacts of the loan features and geographic variation are not substantively different in specifications with both, one, or neither of these variables.[24] As noted in endnotes 6 and 7, using alternative definitions of *RefiPremium* and *PaymentAdj* also did not substantively alter the results.

5. Conclusion

As discussed above, federal-level regulation of a particular loan feature rests on three premises: (1) there are negative externalities associated with foreclosures, (2) the negative

effects of the loan feature outweigh the positive effects, and (3) the overall effects are on net consistently negative in mortgage markets across the country. The third premise is necessary to justify regulatory decision-making at the federal level, rather than at lower levels where the net effects of the loan feature in specific mortgage markets can be considered. This is the first paper to empirically test the third premise, doing so by examining the extent of geographic variation in the effects of prepayment penalties, balloon loans, and reduced documentation on the probabilities of foreclosure and prepayment in a sample of over 810,000 subprime purchase and refinance mortgages originated during 2002-2006 in ten MSAs. Findings indicate substantial geographic variation in the effects of prepayment penalties and balloon loans on the probability of foreclosure, and in the effects of reduced documentation on the probability of prepayment. These findings are robust to multiple specifications, including controls for a variety of state APL provisions. Although more definitive conclusions regarding the effects of specific APL provisions on foreclosures and prepayments require more extensive analysis than the scope of this paper permits, in general the APL provisions included here are associated with lesser probabilities of foreclosure and greater probabilities of prepayment. More pertinent to the focus of this paper, APL provisions appear to be related to some of the geographic variation in the effects of the examined loan features, but significant geographic variation remains even after controlling for APL provisions.

Geographic variation in the effects of the loan features on the probabilities of foreclosure and prepayment raises the likelihood that their overall effects may be negative in some markets but positive in others, calling the third premise into question. To the extent this is true, federal-level regulations intended to curb abuses associated with those loan features would need to be designed with great subtlety and flexibility to avoid causing unwelcome distortions in some

markets. Decisions of whether or how to regulate particular loan features therefore may be more optimally made at lower governmental levels.

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Table 1 – Sample MSAs

Foreclosure rates (percentages of total households entering some stage of foreclosure) for 2007 for the selected MSAs are from RealtyTrac (2008). Population figures are from the U.S. Census Bureau's annual estimates for July 1, 2007.

	Foreclosure	Population		Sample Loans		Sample Observations	
MSA	Rate	Number	Percent	Number	Percent	Number	Percent
Miami, FL	2.7%	2,382,961	4.6%	62,268	7.7%	1,567,651	8.0%
Atlanta, GA	2.5%	5,261,296	10.2%	84,060	10.4%	2,260,693	11.5%
Phoenix, AZ	1.9%	4,165,921	8.1%	82,908	10.2%	1,931,039	9.9%
Chicago, IL	1.6%	7,929,840	15.4%	158,398	19.5%	3,342,349	17.1%
Los Angeles, CA	1.4%	9,807,870	19.1%	184,578	22.8%	4,329,922	22.1%
San Antonio, TX	1.1%	1,984,921	3.9%	22,119	2.7%	751,397	3.8%
Minneapolis, MN-WI	0.8%	3,197,620	6.2%	64,131	7.9%	1,523,284	7.8%
Baltimore, MD	0.7%	2,663,805	5.2%	51,218	6.3%	1,048,754	5.4%
New York City, NY-NJ	0.5%	11,627,931	22.6%	70,472	8.7%	1,831,455	9.4%
Pittsburgh, PA	0.4%	2,354,159	4.6%	30,347	3.7%	996,885	5.1%
Total		51,376,324		810,499		19,583,429	

Table 2 – Variable definitions

Quarterly MSA-level home price index values are from Freddie Mac's conventional mortgage home price indices. Monthly MSA-level unemployment rates are from the Bureau of Labor Statistics. Monthly fixed-rate and adjustable-rate mortgage interest rates are from Freddie Mac's Primary Mortgage Market Survey (PMMS). Information on state foreclosure laws is from Ghent and Kudlyak (2010).

Variable	Definition
Loan Features:	
PrepayPen	Equals 1 if a prepayment penalty is in effect in the current month, 0 otherwise
PrepayPenEnd	Equals 1 in the month that a prepayment penalty ends and in the two following months, 0 otherwise
Balloon	Equals 1 if the loan features a balloon payment, 0 otherwise
LowNoDoc	Equals 1 if the loan is a low- or no-documentation loan, 0 otherwise
Controls (FRMs and ARMs):	
FICO	Borrower's FICO score at origination
CLTV	Current loan balance divided by current home value, where current home value is estimated as (1+ MSA home price appreciation since origination) multiplied by the loan amount at origination divided by the loan-to-value ratio at origination
Cashout	Equals 1 if the loan is a cashout refinancing, 0 otherwise (refinance loans only)
LoanAge	Months since loan origination
RelLoanSize	Ratio of loan origination amount to the average origination amount of all sample loans of the same type (FRM or ARM) and purpose (purchase or refinance) originated in the same MSA and year
ChgUnempl	Current monthly MSA unemployment rate minus the monthly MSA unemployment rate at origination
VarHPI	Standard deviation of quarterly MSA home price index over the previous eight quarters
Judicial	Equals 1 if the state is a judicial foreclosure state, 0 if a non-judicial foreclosure state
Controls (FRMs only):	
RefiPremium	Loan interest rate minus current monthly fixed-rate mortgage PMMS interest rate (30-year or 15-year, depending on original loan term), divided by the loan interest rate
VarFixed	Standard deviation of monthly fixed-rate mortgage PMMS interest rate (30-year or 15-year, depending on original loan term) over the previous 24 months
Controls (ARMs only):	
PaymentAdj	Percentage change in monthly payment at the time of the most recent interest rate reset, constrained to be non-negative and to equal 0 prior to the loan's first scheduled rate reset
Adj1st	Equals 1 in the month of the first scheduled rate reset and in the following two months, 0 otherwise
PostAdj1st	Equals 1 three months or more after the first scheduled rate reset, 0 otherwise
Spread	Current monthly 30-year fixed-rate mortgage PMMS interest rate minus current monthly 1-year adjustable-rate mortgage PMMS interest rate
VarLIBOR	Standard deviation of monthly 6-month London Interbank Offer Rate (LIBOR) over the previous 24 months

Table 3: Summary statistics by loan category

The "Mean" and St.Dev." columns provide figures for the pooled samples after random selections. The MSA columns provide means for the full samples from each MSA.

	Purchase FRMs				**Refinance FRMs**			
	Mean	St.Dev.	Lowest MSA	Highest MSA	Mean	St.Dev.	Lowest MSA	Highest MSA
PrepayPen	0.314	0.464	0.118 (Chi)	0.634 (Mia)	0.438	0.496	0.111 (SA)	0.716 (Mia)
PrepayPenEnd	0.019	0.138	0.009 (Balt)	0.027 (SA)	0.025	0.155	0.006 (SA)	0.049 (NYC)
Balloon	0.043	0.204	0.017 (SA)	0.117 (Chi)	0.038	0.190	0.003 (SA)	0.063 (Chi)
LowNoDoc	0.559	0.496	0.305 (Pitt)	0.741 (NYC)	0.409	0.492	0.243 (Pitt)	0.490 (LA)
FICO	691.492	61.903	662.830 (SA)	708.202 (Minn)	650.428	67.232	610.460 (SA)	669.030 (LA)
CLTV	70.200	15.807	62.441 (LA)	79.595 (Pitt)	59.501	18.444	51.267 (LA)	72.156 (Pitt)
Cashout	0.000	0.000	0.000 ---	0.000 ---	0.807	0.394	0.751 (Atl)	0.876 (Mia)
LoanAge	22.378	14.778	20.760 (Chi)	24.236 (Pitt)	22.756	15.121	20.502 (Balt)	26.045 (Pitt)
RelLoanSize	0.998	0.575	0.961 (Chi)	1.039 (LA)	1.007	0.585	0.972 (Chi)	1.029 (LA)
ChgUnempl	-0.476	1.184	-1.044 (Mia)	0.193 (Minn)	-0.531	1.243	-1.018 (NYC)	0.035 (Minn)
VarHPI	17.189	13.830	5.046 (Atl)	34.345 (Mia)	20.944	15.006	5.071 (Atl)	35.586 (Mia)
Judicial	0.478	0.500	0.000 ---	1.000 ---	0.432	0.495	0.000 ---	1.000 ---
RefiPremium	0.114	0.145	0.058 (LA)	0.186 (SA)	0.107	0.219	0.038 (LA)	0.237 (SA)
VarFixed	0.298	0.087	0.285 (SA)	0.309 (LA)	0.297	0.086	0.291 (Balt)	0.300 (Minn)
% foreclosures	10.6%		4.1% (LA)	18.0% (Atl)	7.0%		3.1% (LA)	14.8% (Pitt)
% prepayments	48.3%		37.7% (SA)	75.8% (Mia)	50.4%		31.6% (Pitt)	73.0% (LA)
Loans	35,900		2,258 (Pitt)	9,103 (LA)	52,170		7,769 (SA)	56,123 (LA)
Observations	1,015,523		99,496 (Balt)	347,411 (LA)	1,479,473		304,376 (SA)	2,247,208 (LA)
	Purchase ARMs				**Refinance ARMs**			
	Mean	St.Dev.	Lowest MSA	Highest MSA	Mean	St.Dev.	Lowest MSA	Highest MSA
PrepayPen	0.483	0.500	0.180 (NYC)	0.761 (Mia)	0.503	0.500	0.110 (SA)	0.801 (Mia)
PrepayPenEnd	0.042	0.202	0.022 (Atl)	0.068 (SA)	0.036	0.187	0.010 (SA)	0.057 (Pitt)
LowNoDoc	0.465	0.499	0.258 (Pitt)	0.728 (NYC)	0.344	0.475	0.229 (Pitt)	0.657 (LA)
FICO	633.751	55.055	613.306 (SA)	676.943 (LA)	589.167	53.386	572.902 (SA)	638.975 (LA)
CLTV	75.381	11.492	70.589 (LA)	81.885 (Pitt)	69.919	14.265	63.413 (NYC)	77.400 (Atl)
Cashout	0.000	0.000	0.000 ---	0.000 ---	0.878	0.327	0.805 (SA)	0.916 (Mia)
LoanAge	17.393	11.224	15.747 (LA)	21.017 (Pitt)	17.104	11.753	15.278 (Balt)	22.424 (Pitt)
RelLoanSize	0.974	0.466	0.955 (Chi)	1.019 (NYC)	0.981	0.475	0.946 (SA)	1.014 (NYC)
ChgUnempl	-0.383	0.962	-0.566 (Mia)	0.023 (Minn)	-0.405	0.943	-0.612 (NYC)	-0.013 (Minn)
VarHPI	17.640	13.821	5.289 (Atl)	36.855 (Mia)	18.639	13.773	5.325 (Atl)	37.175 (Mia)
Judicial	0.468	0.499	0.000 ---	1.000 ---	0.471	0.499	0.000 ---	1.000 ---
PaymentAdj	0.019	0.062	0.018 (Pho)	0.026 (LA)	0.017	0.056	0.016 (Balt)	0.034 (LA)
Adj1st	0.060	0.237	0.032 (LA)	0.072 (SA)	0.054	0.225	0.024 (LA)	0.064 (Pitt)
PostAdj1st	0.155	0.362	0.055 (LA)	0.234 (Pitt)	0.151	0.358	0.047 (LA)	0.276 (Pitt)
Spread	1.197	0.479	1.092 (SA)	1.277 (LA)	1.262	0.500	1.132 (Balt)	1.270 (Minn)
VarLIBOR	0.776	0.336	0.766 (LA)	0.804 (NYC)	0.771	0.344	0.769 (Minn)	0.800 (Balt)
% foreclosures	23.7%		12.9% (LA)	38.1% (Atl)	14.5%		8.0% (LA)	23.4% (Pitt)
% prepayments	64.7%		44.1% (Atl)	83.7% (LA)	75.2%		50.4% (Pitt)	87.5% (LA)
Loans	39,069		6,535 (SA)	43,427 (Chi)	39,313		5,019 (SA)	86,038 (LA)
Observations	833,436		175,971 (Balt)	1,062,936 (Chi)	759,957		141,639 (SA)	2,419,400 (LA)

Table 4 – Changes in the probability of a foreclosure start and a prepayment – all 10 MSAs pooled

This table presents results of multinomial logit regressions with unobserved heterogeneity based on monthly data for loans originated during 2002-2006. Variables are defined as in Table 2. Each coefficient estimate represents the impact on the probability of a first foreclosure start or a prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Vintage year and MSA indicators are included in all specifications. Robust standard errors clustered by loan are in brackets. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Purchase FRMs		**Refinance FRMs**		**Purchase ARMs**		**Refinance ARMs**	
	Foreclosure	Prepayment	Foreclosure	Prepayment	Foreclosure	Prepayment	Foreclosure	Prepayment
PrepayPen	-0.145**	-0.694***	-0.160**	-0.314***	-0.542***	-1.224***	-0.480***	-0.956***
	[0.0620]	[0.0242]	[0.0777]	[0.0303]	[0.0438]	[0.0373]	[0.0526]	[0.0359]
PrepayPenEnd	0.238	0.566***	-0.137	0.295***	0.673***	1.024***	1.004***	1.161***
	[0.168]	[0.0436]	[0.147]	[0.0403]	[0.118]	[0.0965]	[0.162]	[0.142]
Balloon	0.0872	-0.272***	0.252**	-0.0974**				
	[0.100]	[0.0429]	[0.0990]	[0.0415]				
LowNoDoc	0.474***	0.0899***	0.547***	0.000165	0.413***	0.0779***	0.570***	-0.00192
	[0.0532]	[0.0194]	[0.0545]	[0.0157]	[0.0315]	[0.0238]	[0.0371]	[0.0243]
Cashout			0.203***	0.0931***			-0.128**	-0.0103
			[0.0693]	[0.0190]			[0.0520]	[0.0331]
FICO	-0.0103***	0.0002	-0.0122***	-0.0019***	-0.0065***	-0.0007***	-0.0096***	-0.0025***
	[0.000603]	[0.000178]	[0.00102]	[0.000191]	[0.000310]	[0.000215]	[0.000383]	[0.000227]
CLTV	0.0420***	-0.0079***	0.0415***	0.0035***	0.0169***	-0.0189***	0.0278***	-0.0073***
	[0.00305]	[0.000850]	[0.00362]	[0.000616]	[0.00161]	[0.00137]	[0.00182]	[0.00116]
RefiPremium	7.739***	4.578***	5.444***	2.907***				
	[0.399]	[0.120]	[0.864]	[0.653]				
PaymentAdj					1.441***	1.774***	1.907***	2.039***
					[0.302]	[0.231]	[0.388]	[0.283]
Adj1st					0.301***	0.962***	0.553***	1.328***
					[0.107]	[0.0885]	[0.133]	[0.108]
PostAdj1st					0.322***	0.0990	0.343***	0.214***
					[0.0849]	[0.0753]	[0.0976]	[0.0826]
Spread					-0.689***	-0.0701	-0.411***	-0.139**
					[0.0699]	[0.0572]	[0.0807]	[0.0584]
LoanAge	0.131***	0.0665***	0.158***	0.0529***	0.142***	0.155***	0.180***	0.132***
	[0.00794]	[0.00278]	[0.0191]	[0.00586]	[0.00698]	[0.00625]	[0.00741]	[0.00544]
$(LoanAge)^2$	-0.0015***	-0.0015***	-0.0019***	-0.0012***	-0.0023***	-0.0031***	-0.0027***	-0.0027***
	[0.000119]	[0.00005]	[0.000291]	[0.00009]	[0.000139]	[0.000128]	[0.000148]	[0.000112]
RelLoanSize	0.340***	0.0817***	0.179***	0.0277	0.421***	0.263***	0.203***	0.210***
	[0.0448]	[0.0166]	[0.0489]	[0.0227]	[0.0313]	[0.0263]	[0.0396]	[0.0269]
ChgUnempl	0.0501*	-0.110***	0.0499**	-0.121***	0.0281	-0.161***	-0.0265	-0.194***
	[0.0256]	[0.0103]	[0.0242]	[0.0115]	[0.0189]	[0.0155]	[0.0226]	[0.0160]
VarHPI	0.00254	0.0172***	0.00584	0.0226***	-0.00441**	0.0397***	0.0144***	0.0504***
	[0.00302]	[0.00108]	[0.00431]	[0.00212]	[0.00217]	[0.00169]	[0.00264]	[0.00179]
VarFixed	-0.603*	0.166	-0.628*	0.155*				
	[0.350]	[0.109]	[0.352]	[0.0925]				
VarLIBOR					-0.101**	-0.251***	-0.233***	-0.458***
					[0.0505]	[0.0404]	[0.0618]	[0.0426]
Judicial	-0.637	-0.206	-0.114	0.0988	-0.583**	-0.512***	-0.530*	-0.178
	[0.530]	[0.190]	[0.457]	[0.163]	[0.291]	[0.197]	[0.286]	[0.200]
Constant1	-9.082***	-4.817***	-7.632***	-4.072***	-5.538***	-5.542***	-7.046***	-5.746***
	[0.616]	[0.166]	[0.659]	[0.454]	[0.494]	[0.253]	[0.708]	[0.275]
Constant2	-1.281***	-1.305***	-0.314	-0.461	0.935***	0.277	0.438	0.876***
	[0.470]	[0.206]	[0.714]	[0.511]	[0.306]	[0.252]	[0.335]	[0.238]
Prob. Coeff.	3.568***		3.951***		2.114***		2.122***	
	[0.126]		[0.278]		[0.0414]		[0.0318]	
Probability1	97.3%		98.1%		89.2%		89.3%	
Observations	972,557		1,434,519		720,265		685,866	
Loans	35,900		52,170		39,069		39,313	
Log-Likelihood	-102,880		-148,354		-146,690		-145,806	

Table 5: Wilcoxon tests for equality of survival curves across MSAs

Numbers are χ^2 statistics from Wilcoxon tests for the equality of non-parametric survival curves across each pair of MSAs for each loan category. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

Purchase FRMs	Miami	Atlanta	Phoenix	Chicago	Los Angeles	San Antonio	Minneapolis	Baltimore	New York City
Atlanta	352.14***								
Phoenix	0.58	358.34***							
Chicago	18.59***	564.45***	10.93***						
Los Angeles	124.43***	868.59***	103.19***	54.94***					
San Antonio	718.82***	160.31***	726.26***	884.33***	1,038.65***				
Minneapolis	100.50***	19.20***	103.64***	182.90***	315.19***	211.80***			
Baltimore	33.06***	89.38***	38.91***	82.76***	187.63***	368.89***	14.68***		
New York City	40.15***	143.89***	44.43***	128.18***	339.46***	442.73***	23.52***	0.29	
Pittsburgh	513.78***	73.13***	518.23***	657.82***	804.04***	13.00***	118.44***	236.73***	289.39***
Refinance FRMs	Miami	Atlanta	Phoenix	Chicago	Los Angeles	San Antonio	Minneapolis	Baltimore	New York City
Atlanta	117.66***								
Phoenix	14.79***	48.99***							
Chicago	0.60	139.13***	21.89***						
Los Angeles	79.30***	357.55***	164.95***	72.44***					
San Antonio	163.02***	22.59***	100.88***	173.05***	295.27***				
Minneapolis	5.28**	120.14***	30.40***	2.66	15.11***	156.86***			
Baltimore	1.69	87.06***	5.43**	3.95**	92.10***	140.69***	10.31***		
New York City	0.02	109.15***	14.19***	1.27	93.64***	148.25***	7.53***	1.40	
Pittsburgh	171.82***	19.39***	101.71***	185.57***	330.99***	0.35	163.69***	144.93***	156.05***
Purchase ARMs	Miami	Atlanta	Phoenix	Chicago	Los Angeles	San Antonio	Minneapolis	Baltimore	New York City
Atlanta	165.90***								
Phoenix	0.13	176.61***							
Chicago	1.62	195.42***	0.74						
Los Angeles	968.00***	2,375.29***	1,224.95***	1,905.08***					
San Antonio	407.25***	165.57***	409.41***	398.41***	1,243.12***				
Minneapolis	12.52***	235.51***	18.39***	28.03***	555.85***	442.30***			
Baltimore	10.23***	40.23***	10.05***	6.58**	619.63***	247.14***	33.31***		
New York City	1.71	167.84***	1.62	6.19**	662.12***	411.41***	4.43**	16.25***	
Pittsburgh	244.79***	63.33***	244.50***	239.50***	1,038.97***	17.83***	282.96***	126.35***	247.55***
Refinance ARMs	Miami	Atlanta	Phoenix	Chicago	Los Angeles	San Antonio	Minneapolis	Baltimore	New York City
Atlanta	17.12***								
Phoenix	0.06	26.03***							
Chicago	47.49***	166.71***	75.46***						
Los Angeles	577.88***	1,044.31***	998.67***	749.87***					
San Antonio	45.71***	22.34***	51.19***	91.03***	261.41***				
Minneapolis	201.43***	399.97***	307.32***	139.40***	60.60***	155.23***			
Baltimore	2.01	33.84***	1.68	38.31***	663.58***	57.50***	209.34***		
New York City	108.52***	239.96***	154.00***	30.35***	200.55***	126.62***	24.34***	102.81***	
Pittsburgh	80.32***	36.76***	96.71***	191.07***	590.90***	0.43	322.10***	105.65***	253.88***

Table 6a – Changes in the probability of a foreclosure start and a prepayment by MSA – FRMs

This table presents results of multinomial logit regressions with unobserved heterogeneity based on monthly data for fixed-rate loans originated during 2002-2006. Specifications include the same control variables as in Table 4, with the exception of *Judicial* and MSA indicators. Variables are defined as in Table 2. Each coefficient estimate represents the impact on the probability of a first foreclosure start or a prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Robust standard errors clustered by loan are in brackets. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively. Due to non-convergence, the constant heterogeneity weight approach described in Section 3 was used in the purchase FRM regressions for Minneapolis and Pittsburgh, and in the refinance FRM regression for Baltimore.

					Purchase FRMs					
					Foreclosure equation results					
	Miami	Atlanta	Phoenix	Chicago	Los Angeles	San Antonio	Minneapolis	Baltimore	New York City	Pittsburgh
PrepayPen	-0.0795	-0.239	-0.351**	-0.549***	-0.184*	-0.167	-0.00854	-0.219	0.00651	0.134
	[0.119]	[0.157]	[0.142]	[0.156]	[0.100]	[0.162]	[0.165]	[0.241]	[0.115]	[0.121]
Balloon	0.147	0.666*	0.640***	-0.543***	0.510***	-0.146	-0.346	-0.115	0.0369	0.160
	[0.189]	[0.381]	[0.232]	[0.147]	[0.144]	[0.413]	[0.257]	[0.300]	[0.163]	[0.251]
LowNoDoc	-0.0600	0.661***	0.405***	0.434***	0.544***	0.405***	0.730***	0.660***	0.519***	0.520***
	[0.0940]	[0.128]	[0.122]	[0.0912]	[0.0943]	[0.127]	[0.132]	[0.172]	[0.104]	[0.126]
					Prepayment equation results					
	Miami	Atlanta	Phoenix	Chicago	Los Angeles	San Antonio	Minneapolis	Baltimore	New York City	Pittsburgh
PrepayPen	-0.802***	-0.587***	-1.191***	-1.488***	-0.781***	-1.044***	-0.508***	-0.689***	-1.234***	-0.609***
	[0.0870]	[0.0617]	[0.112]	[0.0971]	[0.0384]	[0.131]	[0.0738]	[0.126]	[0.0783]	[0.0788]
Balloon	-0.465**	-0.196	-0.132	-0.174***	-0.404***	-0.313	-0.290***	-0.521**	-0.235*	-0.268
	[0.195]	[0.122]	[0.205]	[0.0592]	[0.141]	[0.391]	[0.102]	[0.219]	[0.131]	[0.197]
LowNoDoc	0.132**	0.0785*	-0.178***	0.323***	-0.0670**	0.0155	0.130**	0.0593	0.104**	0.0267
	[0.0559]	[0.0436]	[0.0542]	[0.0420]	[0.0326]	[0.0992]	[0.0634]	[0.0835]	[0.0484]	[0.0764]
Observations	182,621	258,782	149,652	222,515	340,597	152,932	124,155	96,854	278,983	132,936
Loans	3,966	5,772	4,178	6,453	9,103	2,796	3,422	2,781	7,104	2,258
Log-Likelihood	-22,373	-24,077	-18,329	-31,201	-39,650	-9,445	-11,143	-11,007	-27,685	-9,397
					Refinance FRMs					
					Foreclosure equation results					
	Miami	Atlanta	Phoenix	Chicago	Los Angeles	San Antonio	Minneapolis	Baltimore	New York City	Pittsburgh
PrepayPen	-0.116	-0.243**	-0.383***	-0.551***	0.216***	-0.147	0.119	-0.252***	-0.272**	-0.322***
	[0.0896]	[0.119]	[0.0846]	[0.126]	[0.0675]	[0.166]	[0.0936]	[0.0910]	[0.136]	[0.103]
Balloon	0.199*	0.267**	0.327***	0.0625	0.545***	-1.658*	0.0484	0.0579	-0.101	-0.0273
	[0.114]	[0.136]	[0.119]	[0.107]	[0.0910]	[1.005]	[0.142]	[0.142]	[0.138]	[0.208]
LowNoDoc	0.264***	0.500***	0.526***	0.690***	0.342***	0.250***	0.850***	0.316***	0.501***	0.406***
	[0.0630]	[0.0893]	[0.0697]	[0.0660]	[0.0528]	[0.0787]	[0.0957]	[0.0928]	[0.0849]	[0.0907]
					Prepayment equation results					
	Miami	Atlanta	Phoenix	Chicago	Los Angeles	San Antonio	Minneapolis	Baltimore	New York City	Pittsburgh
PrepayPen	-0.208***	-0.460***	-0.638***	-0.686***	-0.295***	-0.855***	-0.149***	-0.360***	-0.820***	-0.483***
	[0.0482]	[0.0462]	[0.0479]	[0.0469]	[0.0198]	[0.169]	[0.0334]	[0.0588]	[0.0365]	[0.0963]
Balloon	-0.0242	-0.0999	-0.0850	-0.0658	-0.154***	-1.565**	-0.259***	-0.0930	-0.138**	-0.256
	[0.0938]	[0.105]	[0.103]	[0.0414]	[0.0411]	[0.650]	[0.0585]	[0.0873]	[0.0596]	[0.206]
LowNoDoc	-0.0509	-0.0203	-0.195***	0.127***	-0.0104	-0.274***	0.0229	-0.104**	0.0461**	-0.136*
	[0.0340]	[0.0395]	[0.0403]	[0.0240]	[0.0144]	[0.0840]	[0.0318]	[0.0520]	[0.0202]	[0.0788]
Observations	633,006	606,844	561,425	785,113	2,220,258	289,787	446,679	411,085	875,072	360,089
Loans	18,474	14,693	15,006	22,514	56,123	7,769	10,648	13,266	22,142	9,067
Log-Likelihood	-68,233	-53,647	-59,101	-92,453	-233,471	-21,016	-44,810	-52,320	-87,477	-25,312

Table 6b – Changes in the probability of a foreclosure start and a prepayment by MSA – ARMs

This table presents results of multinomial logit regressions with unobserved heterogeneity based on monthly data for adjustable-rate loans originated during 2002-2006. Specifications include the same control variables as in Table 4, with the exception of *Judicial* and MSA indicators. Variables are defined as in Table 2. Each coefficient estimate represents the impact on the probability of a first foreclosure start or a prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Robust standard errors clustered by loan are in brackets. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively. Due to non-convergence, the constant heterogeneity weight approach described in Section 3 was used in the purchase ARM regressions for Chicago, San Antonio, and Baltimore, and in the refinance ARM regressions for Chicago, Los Angeles, San Antonio, Baltimore, New York City, and Pittsburgh.

					Purchase ARMs					
					Foreclosure equation results					
	Miami	Atlanta	Phoenix	Chicago	Los Angeles	San Antonio	Minneapolis	Baltimore	New York City	Pittsburgh
PrepayPen	-7.940***	-0.646***	-1.795***	-0.603***	-1.916***	-0.283*	-0.121	-0.485***	-0.474***	0.0384
	[1.448]	[0.0543]	[0.175]	[0.0392]	[0.114]	[0.153]	[0.118]	[0.0838]	[0.0887]	[0.207]
LowNoDoc	0.0886	0.744***	0.459***	0.247***	0.290***	0.0661	0.764***	0.265***	0.564***	0.832***
	[0.0676]	[0.0506]	[0.0531]	[0.0294]	[0.0462]	[0.0626]	[0.0754]	[0.0725]	[0.0727]	[0.158]
					Prepayment equation results					
	Miami	Atlanta	Phoenix	Chicago	Los Angeles	San Antonio	Minneapolis	Baltimore	New York City	Pittsburgh
PrepayPen	-8.862***	-0.699***	-2.903***	-1.441***	-2.906***	-0.884***	-0.576***	-0.774***	-1.422***	-0.817***
	[1.441]	[0.0502]	[0.166]	[0.0340]	[0.107]	[0.102]	[0.0933]	[0.0450]	[0.0790]	[0.0710]
LowNoDoc	0.127**	0.327***	-0.0950***	0.111***	0.115***	-0.184***	0.264***	-0.00253	0.258***	-0.0471
	[0.0559]	[0.0442]	[0.0343]	[0.0228]	[0.0279]	[0.0546]	[0.0530]	[0.0420]	[0.0618]	[0.0424]
Observations	328,264	568,670	414,785	809,047	536,185	182,393	264,283	132,820	196,289	182,104
Loans	16,957	26,868	20,518	43,427	33,314	6,535	12,920	7,581	11,265	7,099
Log-Likelihood	-65,999	-106,736	-77,120	-173,771	-129,121	-21,633	-53,660	-28,907	-45,404	-24,909
					Refinance ARMs					
					Foreclosure equation results					
	Miami	Atlanta	Phoenix	Chicago	Los Angeles	San Antonio	Minneapolis	Baltimore	New York City	Pittsburgh
PrepayPen	-0.939***	-0.243***	-1.492***	-0.467***	-0.802***	-0.643***	-0.220***	-0.891***	-0.528***	-0.498***
	[0.155]	[0.0492]	[0.114]	[0.0289]	[0.0614]	[0.213]	[0.0632]	[0.0655]	[0.0667]	[0.101]
LowNoDoc	0.295***	0.481***	0.467***	0.481***	0.482***	0.365***	0.703***	0.364***	0.544***	0.387***
	[0.0618]	[0.0482]	[0.0397]	[0.0226]	[0.0291]	[0.106]	[0.0421]	[0.0607]	[0.0459]	[0.0679]
					Prepayment equation results					
	Miami	Atlanta	Phoenix	Chicago	Los Angeles	San Antonio	Minneapolis	Baltimore	New York City	Pittsburgh
PrepayPen	-1.119***	-0.574***	-1.929***	-1.022***	-1.085***	-1.416***	-0.439***	-1.017***	-1.087***	-0.828***
	[0.122]	[0.0416]	[0.102]	[0.0163]	[0.0383]	[0.227]	[0.0486]	[0.0391]	[0.0442]	[0.0809]
LowNoDoc	-0.0200	-0.0946**	-0.129***	0.00959	0.129***	-0.152	0.124***	-0.232***	0.164***	-0.173***
	[0.0406]	[0.0379]	[0.0266]	[0.0136]	[0.0140]	[0.104]	[0.0311]	[0.0414]	[0.0329]	[0.0477]
Observations	423,760	826,397	805,177	1,525,674	1,232,882	126,285	688,167	407,995	481,111	321,756
Loans	22,871	36,727	43,206	86,004	86,038	5,019	37,141	27,590	29,961	11,923
Log-Likelihood	-85,557	-143,482	-158,076	-327,801	-312,014	-17,719	-148,175	-99,836	-113,457	-43,189

Table 7a – Differences in loan feature coefficient estimates across individual MSA regressions – foreclosure equations

The listed pairs of MSAs exhibit coefficient estimates for *PrepayPen*, *Balloon*, or *LowNoDoc* that (1) have opposite signs and (2) are different at the 10% level of significance or greater. Coefficient estimates of unlisted MSA pairs either have the same sign or do not exhibit a statistically significant difference. These coefficient estimate differences are based on the foreclosure equation results from Table 6. Differences based on the prepayment equation results from Table 6 are presented in Table 7b. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Based on foreclosure equation results from Table 6			
	Purchase FRMs	**Refinance FRMs**	**Purchase ARMs**	**Refinance ARMs**
PrepayPen	New York City and Chicago*** New York City and Phoenix * Pittsburgh and Atlanta* Pittsburgh and Chicago*** Pittsburgh and Los Angeles** Pittsburgh and Phoenix***	Los Angeles and Atlanta*** Los Angeles and Baltimore*** Los Angeles and Chicago*** Los Angeles and Miami*** Los Angeles and New York City*** Los Angeles and Phoenix*** Los Angeles and Pittsburgh*** Los Angeles and San Antonio** Minneapolis and Atlanta** Minneapolis and Baltimore*** Minneapolis and Chicago*** Minneapolis and Miami* Minneapolis and New York City** Minneapolis and Phoenix*** Minneapolis and Pittsburgh***	Pittsburgh and Atlanta*** Pittsburgh and Baltimore** Pittsburgh and Chicago*** Pittsburgh and Los Angeles*** Pittsburgh and Miami*** Pittsburgh and New York City** Pittsburgh and Phoenix***	No significant opposite-sign differences
Balloon	Baltimore and Los Angeles* Baltimore and Phoenix** Chicago and Atlanta*** Chicago and Los Angeles*** Chicago and Miami*** Chicago and New York City*** Chicago and Phoenix*** Chicago and Pittsburgh*** Minneapolis and Atlanta** Minneapolis and Los Angeles*** Minneapolis and Phoenix*** San Antonio and Phoenix*	New York City and Atlanta* New York City and Los Angeles*** New York City and Miami* New York City and Phoenix** Pittsburgh and Los Angeles** San Antonio and Atlanta* San Antonio and Baltimore* San Antonio and Chicago* San Antonio and Los Angeles** San Antonio and Miami* San Antonio and Minneapolis* San Antonio and Phoenix**		
LowNoDoc	Miami and Atlanta*** Miami and Baltimore*** Miami and Chicago*** Miami and Los Angeles*** Miami and Minneapolis*** Miami and New York City*** Miami and Phoenix*** Miami and Pittsburgh*** Miami and San Antonio***	No significant opposite-sign differences	No significant opposite-sign differences	No significant opposite-sign differences

Table 7b – Differences in loan feature coefficient estimates across individual MSA regressions – prepayment equations

The listed pairs of MSAs exhibit coefficient estimates for *PrepayPen*, *Balloon*, or *LowNoDoc* that (1) have opposite signs and (2) are different at the 10% level of significance or greater. Coefficient estimates of unlisted MSA pairs either have the same sign or do not exhibit a statistically significant difference. These coefficient estimate differences are based on the prepayment equation results from Table 6. Differences based on the foreclosure equation results from Table 6 are presented in Table 7a. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Based on prepayment equation results from Table 6			
	Purchase FRMs	**Refinance FRMs**	**Purchase ARMs**	**Refinance ARMs**
PrepayPen	No significant opposite-sign differences	No significant opposite-sign differences	No significant opposite-sign differences	No significant opposite-sign differences
Balloon	No significant opposite-sign differences	No significant opposite-sign differences		
LowNoDoc	Los Angeles and Atlanta***	Chicago and Atlanta***	Baltimore and Atlanta***	Chicago and Atlanta***
	Los Angeles and Chicago***	Chicago and Baltimore***	Baltimore and Chicago**	Chicago and Baltimore***
	Los Angeles and Miami***	Chicago and Los Angeles***	Baltimore and Los Angeles**	Chicago and Phoenix***
	Los Angeles and Minneapolis***	Chicago and Miami***	Baltimore and Miami*	Chicago and Pittsburgh***
	Los Angeles and New York City***	Chicago and Phoenix***	Baltimore and Minneapolis***	Los Angeles and Atlanta***
	Phoenix and Atlanta***	Chicago and Pittsburgh***	Baltimore and New York City***	Los Angeles and Baltimore***
	Phoenix and Baltimore**	Chicago and San Antonio***	Phoenix and Atlanta***	Los Angeles and Miami***
	Phoenix and Chicago***	Minneapolis and Baltimore**	Phoenix and Chicago***	Los Angeles and Phoenix***
	Phoenix and Miami***	Minneapolis and Phoenix***	Phoenix and Los Angeles***	Los Angeles and Pittsburgh***
	Phoenix and Minneapolis***	Minneapolis and Pittsburgh*	Phoenix and Miami***	Los Angeles and San Antonio***
	Phoenix and New York City***	Minneapolis and San Antonio***	Phoenix and Minneapolis***	Minneapolis and Atlanta***
	Phoenix and Pittsburgh**	New York City and Baltimore***	Phoenix and New York City***	Minneapolis and Baltimore***
	Phoenix and San Antonio*	New York City and Los Angeles**	Pittsburgh and Atlanta***	Minneapolis and Miami***
		New York City and Miami**	Pittsburgh and Chicago***	Minneapolis and Phoenix***
		New York City and Phoenix***	Pittsburgh and Los Angeles***	Minneapolis and Pittsburgh***
		New York City and Pittsburgh**	Pittsburgh and Miami**	Minneapolis and San Antonio**
		New York City and San Antonio***	Pittsburgh and Minneapolis***	New York City and Atlanta***
			Pittsburgh and New York City***	New York City and Baltimore***
			San Antonio and Atlanta***	New York City and Miami***
			San Antonio and Chicago***	New York City and Phoenix***
			San Antonio and Los Angeles***	New York City and Pittsburgh***
			San Antonio and Miami***	New York City and San Antonio***
			San Antonio and Minneapolis***	
			San Antonio and New York City***	

Table 8 – Changes in the probability of a foreclosure start and a prepayment – MSA-loan feature interactions

This table presents results of multinomial logit regressions with unobserved heterogeneity based on monthly data for loans originated during 2002-2006. Specifications include the same control variables as in Table 4, plus interactions of *PrepayPen*, *PrepayPenEnd*, *Balloon*, and *LowNoDoc* with MSA indicators. Variables are defined as in Table 2. Each coefficient estimate represents the impact on the probability of a first foreclosure start or a prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Robust standard errors clustered by loan are in brackets. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

Purchase FRMs

	Foreclosure				Prepayment			
PrepayPen	0.132				-0.473***			
	[0.140]				[0.0392]			
Balloon	0.805***				-0.232			
	[0.238]	*MSA interactions with:*				*MSA interactions with:*		
LowNoDoc	0.690***	*PrepayPen*	*Balloon*	*LowNoDoc*	-0.0343	*PrepayPen*	*Balloon*	*LowNoDoc*
	[0.144]				[0.0383]			
Miami	1.421***	-0.476**	0.204	-0.608***	-0.371*	-0.102	-0.333	0.137**
	[0.547]	[0.199]	[0.421]	[0.195]	[0.206]	[0.0699]	[0.273]	[0.0661]
Atlanta	0.0595	-0.252	-0.826**	-0.0135	-0.425***	-0.281***	0.299	0.119*
	[0.187]	[0.201]	[0.406]	[0.183]	[0.0632]	[0.0890]	[0.217]	[0.0690]
Phoenix	0.225	-0.754***	0.194	-0.250	0.156**	-0.383***	0.0938	-0.109
	[0.232]	[0.223]	[0.405]	[0.232]	[0.0641]	[0.0720]	[0.248]	[0.0689]
Chicago	1.169**	-0.540**	-1.292***	-0.257	0.129	-0.907***	-0.0337	0.411***
	[0.538]	[0.237]	[0.307]	[0.188]	[0.203]	[0.104]	[0.170]	[0.0655]
San Antonio	-0.974***	-0.612**	-1.183	-0.523**	-0.851***	-0.731***	-0.275	0.0305
	[0.247]	[0.240]	[0.844]	[0.237]	[0.0916]	[0.106]	[0.461]	[0.0996]
Minneapolis	0.109	-0.0460	-1.056**	-0.166	-0.169**	0.112	0.0339	0.199**
	[0.223]	[0.237]	[0.413]	[0.230]	[0.0779]	[0.0963]	[0.196]	[0.0831]
Baltimore	0.302	0.268	-1.105**	-0.161	0.203	0.113	-0.303	0.0446
	[0.559]	[0.398]	[0.464]	[0.281]	[0.204]	[0.115]	[0.201]	[0.0820]
New York City	0.719	0.148	-0.578	-0.0954	-0.272	-0.511***	0.302	0.260***
	[0.550]	[0.214]	[0.361]	[0.212]	[0.204]	[0.0971]	[0.214]	[0.0684]
Pittsburgh	-0.432	-0.543**	-0.665	0.0887	-0.381*	-0.486***	-0.456	0.200*
	[0.560]	[0.245]	[0.489]	[0.260]	[0.210]	[0.106]	[0.315]	[0.107]
	Obs:	972,557	Loans:	35,900	Log-Likelihood:		-102,686	

Refinance FRMs

	Foreclosure				Prepayment			
PrepayPen	0.255**				-0.133***			
	[0.129]				[0.0296]			
Balloon	0.647***				-0.107			
	[0.196]	*MSA interactions with:*			[0.0877]	*MSA interactions with:*		
LowNoDoc	0.218*	*PrepayPen*	*Balloon*	*LowNoDoc*	-0.0405	*PrepayPen*	*Balloon*	*LowNoDoc*
	[0.111]				[0.0276]			
Miami	0.492	-0.776***	0.441	0.377**	-0.564***	-0.166**	0.0863	0.0540
	[0.527]	[0.225]	[0.462]	[0.188]	[0.179]	[0.0661]	[0.184]	[0.0544]
Atlanta	-0.0149	-0.463**	-0.493	0.318	-0.310***	-0.348***	-0.00292	0.140**
	[0.194]	[0.227]	[0.401]	[0.196]	[0.0696]	[0.0786]	[0.188]	[0.0678]
Phoenix	0.420**	-0.531**	-0.660*	0.394*	0.135**	-0.323***	-0.118	-0.00292
	[0.214]	[0.229]	[0.373]	[0.205]	[0.0603]	[0.0691]	[0.167]	[0.0607]
Chicago	0.433	-0.641***	-0.843***	0.704***	-0.0517	-0.477***	0.0857	0.267***
	[0.493]	[0.230]	[0.303]	[0.193]	[0.167]	[0.0722]	[0.121]	[0.0595]
San Antonio	-0.832***	-0.309	-1.040	0.0130	-0.939***	-0.386**	-0.261	-0.0844
	[0.294]	[0.388]	[1.278]	[0.272]	[0.137]	[0.189]	[0.770]	[0.106]
Minneapolis	0.716***	-0.408*	-0.212	0.633***	0.138**	-0.0210	0.0259	0.0613
	[0.208]	[0.217]	[0.342]	[0.205]	[0.0657]	[0.0689]	[0.137]	[0.0678]
Baltimore	0.469	-0.484*	-0.863**	0.187	0.155	-0.187***	0.0297	-0.0962
	[0.499]	[0.250]	[0.385]	[0.224]	[0.168]	[0.0670]	[0.144]	[0.0625]
New York City	0.667	-0.674***	-0.760**	0.406**	-0.123	-0.603***	-0.0165	0.0405
	[0.495]	[0.256]	[0.350]	[0.173]	[0.168]	[0.0811]	[0.150]	[0.0476]
Pittsburgh	-0.0222	-0.579**	-0.380	0.304	-0.783***	-0.380***	-0.188	0.0220
	[0.533]	[0.254]	[0.501]	[0.241]	[0.194]	[0.101]	[0.249]	[0.111]
	Obs:	1,434,519	Loans:	52,170	Log-Likelihood:		-148,187	

Table 8 – Changes in the probability of a foreclosure start and a prepayment – MSA-loan feature interactions (continued)
This table presents results of multinomial logit regressions without unobserved heterogeneity based on monthly data for loans originated during 2002-2006. Specifications include the same control variables as in Table 4, plus interactions of *PrepayPen*, *PrepayPenEnd*, *Balloon*, and *LowNoDoc* with MSA indicators. Variables are defined as in Table 2. Each coefficient estimate represents the impact on the probability of a first foreclosure start or a prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Robust standard errors clustered by loan are in brackets. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

Purchase ARMs

	Foreclosure			Prepayment		
PrepayPen	-1.486***			-1.917***		
	[0.150]	*MSA interactions with:*		[0.137]	*MSA interactions with:*	
LowNoDoc	0.328***	*PrepayPen*	*LowNoDoc*	0.0304	*PrepayPen*	*LowNoDoc*
	[0.0857]			[0.0526]		
Miami	0.192	0.220	-0.0768	-0.425	-0.0589	0.0142
	[0.358]	[0.194]	[0.127]	[0.263]	[0.164]	[0.0932]
Atlanta	-1.622***	1.018***	0.486***	-1.113***	1.088***	0.198**
	[0.170]	[0.162]	[0.114]	[0.152]	[0.151]	[0.0875]
Phoenix	-0.729***	-0.0823	0.114	-0.145	-0.105	-0.215***
	[0.200]	[0.195]	[0.122]	[0.175]	[0.173]	[0.0831]
Chicago	-0.833**	0.982***	-0.0462	-0.452*	0.432***	0.197***
	[0.337]	[0.159]	[0.105]	[0.245]	[0.141]	[0.0737]
San Antonio	-2.529***	0.877***	-0.0524	-1.615***	0.460**	-0.0501
	[0.226]	[0.216]	[0.177]	[0.204]	[0.197]	[0.143]
Minneapolis	-1.542***	1.158***	0.245*	-0.599***	1.027***	0.0675
	[0.205]	[0.195]	[0.132]	[0.177]	[0.173]	[0.0953]
Baltimore	-1.160***	1.019***	-0.182	-0.426	0.946***	-0.0955
	[0.356]	[0.233]	[0.198]	[0.259]	[0.183]	[0.137]
New York City	-1.067***	1.295***	0.407**	-0.650**	0.426**	0.288**
	[0.356]	[0.219]	[0.166]	[0.259]	[0.200]	[0.117]
Pittsburgh	-1.980***	0.953***	0.0753	-0.697**	0.568***	0.217
	[0.369]	[0.214]	[0.181]	[0.279]	[0.193]	[0.146]
	Obs:	720,265	Loans: 39,069	Log-Likelihood:		-146,492

Refinance ARMs

	Foreclosure			Prepayment		
PrepayPen	-1.005***			-1.100***		
	[0.186]	*MSA interactions with:*		[0.141]	*MSA interactions with:*	
LowNoDoc	0.443***	*PrepayPen*	*LowNoDoc*	-0.0518	*PrepayPen*	*LowNoDoc*
	[0.0948]			[0.0527]		
Miami	-0.362	0.374	-0.202	-1.243***	0.173	-0.0933
	[0.409]	[0.277]	[0.165]	[0.308]	[0.221]	[0.105]
Atlanta	-1.077***	0.814***	0.155	-0.590***	0.350**	-0.0820
	[0.212]	[0.214]	[0.142]	[0.158]	[0.162]	[0.0946]
Phoenix	-0.307	-0.198	0.190	0.121	-0.537***	-0.0532
	[0.243]	[0.241]	[0.141]	[0.188]	[0.187]	[0.0866]
Chicago	-0.359	0.411**	0.227*	-0.269	-0.117	0.205***
	[0.353]	[0.196]	[0.123]	[0.256]	[0.144]	[0.0769]
San Antonio	-1.690***	0.946**	0.122	-1.400***	0.426	0.151
	[0.270]	[0.409]	[0.281]	[0.195]	[0.316]	[0.186]
Minneapolis	-0.483**	0.871***	0.291**	-0.0992	0.485***	0.143
	[0.229]	[0.224]	[0.144]	[0.174]	[0.174]	[0.0935]
Baltimore	-0.358	0.281	-0.0565	-0.0515	0.210	-0.0685
	[0.362]	[0.254]	[0.209]	[0.260]	[0.165]	[0.124]
New York City	-0.321	0.573**	0.233	-0.466*	0.125	0.137
	[0.363]	[0.262]	[0.161]	[0.261]	[0.180]	[0.101]
Pittsburgh	-1.193***	0.797***	0.0920	-0.973***	0.120	0.221
	[0.390]	[0.252]	[0.212]	[0.289]	[0.197]	[0.163]
	Obs:	685,866	Loans: 39,313	Log-Likelihood:		-145,700

Table 9a – Differences in coefficient estimates of MSA-loan feature interaction terms in pooled MSA regressions – foreclosure equations

The listed pairs of MSAs exhibit coefficient estimates for interaction variables of MSA indicators and *PrepayPen*, *Balloon*, or *LowNoDoc* such that (1) the combined estimated impacts of the loan feature variable and the MSA-loan feature interaction variable have opposite signs and (2) the MSA-loan feature interaction variables are different at the 10% level of significance or greater. Coefficient estimates of unlisted MSA pairs either have combined estimated impacts of the same sign or interaction variables that do not exhibit a statistically significant difference. These coefficient estimate differences are based on the foreclosure equation results from Table 8. Differences based on the prepayment equation results from Table 8 are presented in Table 9b. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Based on foreclosure equation results from Table 8			
	Purchase FRMs	**Refinance FRMs**	**Purchase ARMs**	**Refinance ARMs**
*MSA*PrepayPen*	Baltimore and Chicago* Baltimore and Miami* Baltimore and Phoenix** Baltimore and Pittsburgh* Baltimore and San Antonio** Los Angeles and Chicago** Los Angeles and Miami** Los Angeles and Phoenix*** Los Angeles and Pittsburgh** Los Angeles and San Antonio** Minneapolis and Chicago* Minneapolis and Miami* Minneapolis and Phoenix*** Minneapolis and Pittsburgh* Minneapolis and San Antonio** New York City and Atlanta* New York City and Chicago*** New York City and Miami*** New York City and Phoenix*** New York City and Pittsburgh*** New York City and San Antonio***	Los Angeles and Atlanta** Los Angeles and Baltimore* Los Angeles and Chicago*** Los Angeles and Miami*** Los Angeles and Minneapolis* Los Angeles and New York City*** Los Angeles and Phoenix** Los Angeles and Pittsburgh**	No significant opposite-sign differences	No significant opposite-sign differences
*MSA*Balloon*	Los Angeles and Atlanta** Los Angeles and Baltimore ** Los Angeles and Chicago*** Los Angeles and Minneapolis** Miami and Atlanta** Miami and Baltimore ** Miami and Chicago*** Miami and Minneapolis*** New York City and Chicago ** Phoenix and Atlanta** Phoenix and Baltimore ** Phoenix and Chicago*** Phoenix and Minneapolis***	Los Angeles and Baltimore** Los Angeles and Chicago*** Los Angeles and New York City** Los Angeles and Phoenix* Miami and Baltimore** Miami and Chicago*** Miami and New York City** Miami and Phoenix** Minneapolis and Chicago*		
*MSA*LowNoDoc*	No significant opposite-sign differences	No significant opposite-sign differences	No significant opposite-sign differences	No significant opposite-sign differences

Table 9b – Differences in coefficient estimates of MSA-loan feature interaction terms in pooled MSA regressions – prepayment equations

The listed pairs of MSAs exhibit coefficient estimates for interaction variables of MSA indicators and *PrepayPen*, *Balloon*, or *LowNoDoc* such that (1) the combined estimated impacts of the loan feature variable and the MSA-loan feature interaction variable have opposite signs and (2) the MSA-loan feature interaction variables are different at the 10% level of significance or greater. Coefficient estimates of unlisted MSA pairs either have combined estimated impacts of the same sign or interaction variables that do not exhibit a statistically significant difference. These coefficient estimate differences are based on the prepayment equation results from Table 8. Differences based on the foreclosure equation results from Table 8 are presented in Table 9a. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Based on prepayment equation results from Table 8			
	Purchase FRMs	**Refinance FRMs**	**Purchase ARMs**	**Refinance ARMs**
*MSA*PrepayPen*	No significant opposite-sign differences	No significant opposite-sign differences	No significant opposite-sign differences	No significant opposite-sign differences
*MSA*Balloon*	Atlanta and Baltimore*** Atlanta and Chicago* Atlanta and Miami** Atlanta and Pittsburgh** New York City and Baltimore*** New York City and Chicago** New York City and Miami** New York City and Pittsburgh**	No significant opposite-sign differences		
*MSA*LowNoDoc*	Los Angeles and Atlanta* Los Angeles and Chicago*** Los Angeles and Miami** Los Angeles and Minneapolis** Los Angeles and New York City*** Los Angeles and Pittsburgh* Phoenix and Atlanta*** Phoenix and Baltimore* Phoenix and Chicago*** Phoenix and Miami*** Phoenix and Minneapolis*** Phoenix and New York City*** Phoenix and Pittsburgh*** San Antonio and Chicago*** San Antonio and New York City**	Atlanta and Baltimore*** Atlanta and Los Angeles** Atlanta and Phoenix* Atlanta and San Antonio* Baltimore and Chicago*** Baltimore and Miami** Baltimore and Minneapolis* Chicago and Los Angeles*** Chicago and Phoenix*** Chicago and Pittsburgh** Chicago and San Antonio***	Baltimore and Atlanta** Baltimore and Chicago** Baltimore and New York City** Baltimore and Pittsburgh* Phoenix and Atlanta*** Phoenix and Chicago*** Phoenix and Los Angeles*** Phoenix and Miami** Phoenix and Minneapolis*** Phoenix and New York City*** Phoenix and Pittsburgh*** San Antonio and Atlanta* San Antonio and Chicago* San Antonio and New York City**	Chicago and Atlanta*** Chicago and Baltimore** Chicago and Los Angeles*** Chicago and Miami*** Chicago and Phoenix*** Minneapolis and Atlanta** Minneapolis and Miami** Minneapolis and Phoenix* New York City and Atlanta* New York City and Miami* New York City and Phoenix* Pittsburgh and Atlanta* Pittsburgh and Miami*

Table 10 – State anti-predatory lending (APL) law variable definitions

For each variable, a value of 1 indicates a provision in a state APL law that is more restrictive on lenders than the relevant provision of the federal Home Ownership and Equity Protection Act (HOEPA), and a value of 0 indicates a provision in a state APL law that is equally or less restrictive than the relevant provision in HOEPA. A covered loan is one that meets the state's criteria for a high-cost loan and so is subject to the restrictions in the state's APL law. State APL information is from an analysis of the relevant states' lending legislation and regulations conducted by the author.

Variable	Definition
TriggerAPR	Equals 1 if the APR threshold above which a state's APL law applies for first-lien loans is lower than the yield on a comparable Treasury security at the time of loan origination plus 8%, 0 otherwise
TriggerPF	Equals 1 if the points and fees threshold above which a state's APL law applies for first-lien loans is lower than the greater of 8% of the loan origination amount or an annually-adjusted dollar amount established by the Truth in Lending Act ($480 in 2002, $528 in 2006), 0 otherwise
FinancingPF	Equals 1 if a state's APL law restricts the amount of points and fees that may be financed on a covered loan, 0 otherwise
PrepayDur	Equals 1 if a state's APL law's prohibition against prepayment penalties on covered loans takes effect sooner than five years after loan origination, 0 otherwise
PrepayAmt	Equals 1 if a state's APL law restricts the maximum amount that can be charged as a prepayment penalty on a covered loan, 0 otherwise
PrepayNoPre	Equals 1 if a state's APL law requires that any lender originating a covered loan with a prepayment penalty must also offer the borrower the choice of a loan with no prepayment penalty
BalloonTerm	Equals 1 if a state's APL law's prohibition against balloon payments on covered loans is in effect for longer than five years after origination, 0 otherwise
Verification	Equals 1 if a state's APL law specifies a minimum standard for the verification of a borrower's ability to pay for a covered loan, 0 otherwise
FlippingDur	Equals 1 if a state's APL law restricts lenders from refinancing covered loans beyond the first twelve months of the original loan, 0 otherwise
OwnRefiPF	Equals 1 if a state's APL law prohibits a lender from financing points and fees on a refinancing of a covered loan originated by the same lender, 0 otherwise

Table 11a – Changes in the probability of a foreclosure start and a prepayment – APL provisions – purchase FRMs
This table presents results of multinomial logit regressions without unobserved heterogeneity based on monthly data for loans originated during 2002-2006. Specifications include the same control variables as in Table 8, plus APL provision variables and their interactions with *PrepayPen*, *PrepayPenEnd*, *Balloon*, and *LowNoDoc*. Variables are defined as in Tables 2 and 10. Each coefficient estimate represents the impact on the probability of a first foreclosure start or a prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Robust standard errors clustered by loan are in brackets. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	APL = *TriggerAPR*							
	Foreclosure				Prepayment			
APL	0.774*	0.563	0.773*	1.051**	0.109	0.060	0.109	-0.0853
	[0.414]	[0.429]	[0.415]	[0.512]	[0.170]	[0.173]	[0.170]	[0.224]
APL**PrepayPen*		1.609				0.452		
		[0.988]				[0.352]		
APL**Balloon*			15.25***				1.542**	
			[0.767]				[0.689]	
APL**LowNoDoc*				-0.505				0.293
				[0.671]				[0.250]
PrepayPen	0.133	0.132	0.133	0.133	-0.473***	-0.473***	-0.473***	-0.473***
	[0.141]	[0.140]	[0.141]	[0.141]	[0.0391]	[0.0392]	[0.0391]	[0.0392]
Balloon	0.803***	0.802***	0.803***	0.802***	-0.233	-0.233	-0.233	-0.233
	[0.239]	[0.237]	[0.240]	[0.239]	[0.153]	[0.153]	[0.153]	[0.153]
LowNoDoc	0.690***	0.689***	0.691***	0.689***	-0.0344	-0.0345	-0.0343	-0.0344
	[0.145]	[0.144]	[0.145]	[0.145]	[0.0383]	[0.0383]	[0.0383]	[0.0383]
Log-Likelihood	-102,684	-102,679	-102,679	-102,682				
	APL = *TriggerPF*							
	Foreclosure				Prepayment			
APL	-0.307**	-0.456***	-0.353***	-0.272	-0.0592	-0.168***	-0.0688	-0.216***
	[0.134]	[0.145]	[0.134]	[0.223]	[0.0441]	[0.0475]	[0.0446]	[0.0740]
APL**PrepayPen*		0.711***				0.782***		
		[0.264]				[0.125]		
APL**Balloon*			1.365**				0.346	
			[0.606]				[0.218]	
APL**LowNoDoc*				-0.0504				0.215**
				[0.247]				[0.0837]
PrepayPen	0.140	-0.573*	0.140	0.141	-0.472***	-1.255***	-0.472***	-0.472***
	[0.142]	[0.300]	[0.141]	[0.142]	[0.0391]	[0.132]	[0.0392]	[0.0391]
Balloon	0.791***	0.788***	-0.572	0.791***	-0.236	-0.237	-0.581**	-0.236
	[0.242]	[0.239]	[0.653]	[0.242]	[0.153]	[0.154]	[0.266]	[0.153]
LowNoDoc	0.690***	0.685***	0.689***	0.741***	-0.0349	-0.0352	-0.0348	-0.250***
	[0.145]	[0.145]	[0.145]	[0.287]	[0.0382]	[0.0384]	[0.0383]	[0.0921]
Log-Likelihood	-102,683	-102,660	-102,679	-102,679				
	APL = *FinancingPF*							
	Foreclosure				Prepayment			
APL	-0.393***	-0.641***	-0.532***	-0.281	-0.188***	-0.273***	-0.204***	-0.508***
	[0.148]	[0.161]	[0.148]	[0.286]	[0.0465]	[0.0513]	[0.0479]	[0.0852]
APL**PrepayPen*		1.270***				0.448***		
		[0.323]				[0.128]		
APL**Balloon*			2.218***				0.314*	
			[0.546]				[0.182]	
APL**LowNoDoc*				-0.134				0.421***
				[0.312]				[0.0950]
PrepayPen	0.140	-1.130***	0.139	0.141	-0.471***	-0.921***	-0.472***	-0.471***
	[0.141]	[0.352]	[0.141]	[0.142]	[0.0392]	[0.134]	[0.0393]	[0.0392]
Balloon	0.791***	0.788***	-1.424**	0.791***	-0.240	-0.241	-0.553**	-0.238
	[0.241]	[0.240]	[0.599]	[0.242]	[0.153]	[0.154]	[0.238]	[0.153]
LowNoDoc	0.691***	0.689***	0.690***	0.826**	-0.0351	-0.0354	-0.0351	-0.456***
	[0.145]	[0.145]	[0.145]	[0.345]	[0.0383]	[0.0385]	[0.0384]	[0.102]
Log-Likelihood	-102,676	-102,660	-102,667	-102,665				

Table 11a – Changes in the probability of a foreclosure start and a prepayment – APL provisions – purchase FRMs (continued)
This table presents results of multinomial logit regressions without unobserved heterogeneity based on monthly data for loans originated during 2002-2006. Specifications include the same control variables as in Table 8, plus APL provision variables and their interactions with *PrepayPen*, *PrepayPenEnd*, *Balloon*, and *LowNoDoc*. Variables are defined as in Tables 2 and 10. Each coefficient estimate represents the impact on the probability of a first foreclosure start or a prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Robust standard errors clustered by loan are in brackets. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	APL = *PrepayDur*				**APL = *PrepayAmt***			
	Foreclosure		Prepayment		Foreclosure		Prepayment	
APL	-0.386***	-0.534***	-0.180***	-0.293***	0.0506	-0.0797	0.153**	-0.0571
	[0.114]	[0.123]	[0.0418]	[0.0452]	[0.181]	[0.214]	[0.0747]	[0.0830]
APL**PrepayPen*		0.828***		0.848***		0.421		0.899***
		[0.254]		[0.124]		[0.348]		[0.164]
PrepayPen	0.139	-0.694**	-0.470***	-1.321***	0.131	-0.291	-0.474***	-1.374***
	[0.141]	[0.292]	[0.0391]	[0.131]	[0.140]	[0.377]	[0.0393]	[0.169]
Balloon	0.793***	0.793***	-0.239	-0.238	0.805***	0.805***	-0.229	-0.230
	[0.241]	[0.238]	[0.153]	[0.154]	[0.237]	[0.236]	[0.153]	[0.153]
LowNoDoc	0.690***	0.685***	-0.0357	-0.0357	0.689***	0.687***	-0.0333	-0.0338
	[0.145]	[0.145]	[0.0382]	[0.0384]	[0.144]	[0.144]	[0.0384]	[0.0384]
Log-Likelihood	-102,673	-102,645			-102,684	-102,668		

	APL = *PrepayNoPre*			
	Foreclosure		Prepayment	
APL	0.0685	0.693**	0.220**	0.479***
	[0.264]	[0.337]	[0.0893]	[0.112]
APL* *PrepayPen*		-1.779***		-0.766***
		[0.552]		[0.192]
PrepayPen	0.132	1.908***	-0.473***	0.293
	[0.140]	[0.570]	[0.0392]	[0.195]
Balloon	0.805***	0.805***	-0.233	-0.233
	[0.238]	[0.237]	[0.153]	[0.153]
LowNoDoc	0.690***	0.690***	-0.0347	-0.0349
	[0.144]	[0.144]	[0.0383]	[0.0384]
Log-Likelihood	-102,683	-102,672		

	APL = *BalloonTerm*				**APL = *Verification***			
	Foreclosure		Prepayment		Foreclosure		Prepayment	
APL	-0.307**	-0.338**	-0.0593	-0.0634	1.865	2.069	-0.161	-0.645
	[0.134]	[0.134]	[0.0441]	[0.0446]	[1.183]	[1.320]	[0.413]	[0.645]
APL**Balloon*		0.937		0.156				
		[0.593]		[0.225]				
APL**LowNoDoc*						-0.407		0.790
						[1.166]		[0.731]
PrepayPen	0.140	0.140	-0.472***	-0.472***	0.131	0.131	-0.473***	-0.473***
	[0.142]	[0.141]	[0.0391]	[0.0392]	[0.141]	[0.141]	[0.0392]	[0.0392]
Balloon	0.791***	-0.145	-0.236	-0.392	0.807***	0.807***	-0.233	-0.232
	[0.242]	[0.641]	[0.153]	[0.271]	[0.239]	[0.239]	[0.153]	[0.153]
LowNoDoc	0.690***	0.689***	-0.0349	-0.0349	0.692***	0.692***	-0.0342	-0.0342
	[0.145]	[0.145]	[0.0382]	[0.0383]	[0.145]	[0.145]	[0.0383]	[0.0383]
Log-Likelihood	-102,683	-102,681			-102,684	-102,683		

Table 11a – Changes in the probability of a foreclosure start and a prepayment – APL provisions – purchase FRMs (continued)
This table presents results of multinomial logit regressions without unobserved heterogeneity based on monthly data for loans originated during 2002-2006. Specifications include the same control variables as in Table 8, plus APL provision variables and their interactions with *PrepayPen*, *PrepayPenEnd*, *Balloon*, and *LowNoDoc*. Variables are defined as in Tables 2 and 10. Each coefficient estimate represents the impact on the probability of a first foreclosure start or a prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Robust standard errors clustered by loan are in brackets. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	APL = *FlippingDur*					
	Foreclosure			Prepayment		
APL	-0.377***	-0.507***	-0.414***	-0.142***	-0.254***	-0.148***
	[0.116]	[0.125]	[0.118]	[0.0424]	[0.0457]	[0.0428]
APL***PrepayPen*		0.763***			0.886***	
		[0.263]			[0.127]	
APL***Balloon*			0.931*			0.239
			[0.517]			[0.230]
PrepayPen	0.138	-0.629**	0.137	-0.471***	-1.360***	-0.472***
	[0.141]	[0.300]	[0.141]	[0.0391]	[0.134]	[0.0392]
Balloon	0.794***	0.794***	-0.135	-0.237	-0.236	-0.476*
	[0.241]	[0.237]	[0.571]	[0.153]	[0.154]	[0.276]
LowNoDoc	0.690***	0.685***	0.690***	-0.0353	-0.0352	-0.0353
	[0.145]	[0.144]	[0.145]	[0.0382]	[0.0384]	[0.0383]
Log-Likelihood	-102,677	-102,649	-102,675			
	APL = *OwnRefiPF*					
	Foreclosure			Prepayment		
APL	-0.495***	-0.640***	-0.569***	-0.153***	-0.212***	-0.161***
	[0.162]	[0.173]	[0.162]	[0.0514]	[0.0551]	[0.0522]
APL***PrepayPen*		0.909**			0.393**	
		[0.430]			[0.190]	
APL***Balloon*			1.684**			0.257
			[0.728]			[0.294]
PrepayPen	0.142	0.141	0.140	-0.472***	-0.473***	-0.473***
	[0.142]	[0.141]	[0.141]	[0.0392]	[0.0393]	[0.0393]
Balloon	0.791***	0.788***	0.793***	-0.237	-0.239	-0.237
	[0.241]	[0.241]	[0.240]	[0.153]	[0.154]	[0.154]
LowNoDoc	0.691***	0.690***	0.689***	-0.0348	-0.035	-0.0349
	[0.145]	[0.145]	[0.145]	[0.0383]	[0.0384]	[0.0384]
Log-Likelihood	-102,678	-102,671	-102,675			

Table 11b – Changes in the probability of a foreclosure start and a prepayment – APL provisions – refinance FRMs
This table presents results of multinomial logit regressions without unobserved heterogeneity based on monthly data for loans originated during 2002-2006. Specifications include the same control variables as in Table 8, plus APL provision variables and their interactions with *PrepayPen*, *PrepayPenEnd*, *Balloon*, and *LowNoDoc*. Variables are defined as in Tables 2 and 10. Each coefficient estimate represents the impact on the probability of a first foreclosure start or a prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Robust standard errors clustered by loan are in brackets. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	APL = *TriggerAPR*							
	Foreclosure				Prepayment			
APL	-0.158	-0.258*	-0.200	-0.219	0.130***	0.119***	0.110**	0.154***
	[0.136]	[0.145]	[0.140]	[0.162]	[0.0443]	[0.0459]	[0.0449]	[0.0542]
APL**PrepayPen*		0.560*				0.087		
		[0.325]				[0.102]		
APL**Balloon*			0.515				0.271**	
			[0.458]				[0.136]	
APL**LowNoDoc*				0.169				-0.0647
				[0.254]				[0.0778]
PrepayPen	0.255**	0.252*	0.254**	0.254**	-0.133***	-0.133***	-0.133***	-0.133***
	[0.129]	[0.129]	[0.129]	[0.129]	[0.0298]	[0.0298]	[0.0298]	[0.0298]
Balloon	0.640***	0.640***	0.643***	0.640***	-0.0995	-0.0995	-0.0977	-0.0996
	[0.197]	[0.197]	[0.197]	[0.197]	[0.0881]	[0.0881]	[0.0881]	[0.0881]
LowNoDoc	0.216*	0.216*	0.216*	0.216*	-0.0399	-0.0400	-0.0399	-0.0400
	[0.111]	[0.111]	[0.111]	[0.111]	[0.0276]	[0.0276]	[0.0276]	[0.0276]
Log-Likelihood	-148,179	-148,177	-148,177	-148,178				
	APL = *TriggerPF*							
	Foreclosure				Prepayment			
APL	-0.183*	-0.349***	-0.214*	-0.124	0.0968***	0.0267	0.0841**	0.113***
	[0.111]	[0.120]	[0.113]	[0.133]	[0.0345]	[0.0354]	[0.0341]	[0.0428]
APL**PrepayPen*		0.660***				0.365***		
		[0.234]				[0.0804]		
APL**Balloon*			0.535				0.248**	
			[0.379]				[0.123]	
APL**LowNoDoc*				-0.147				-0.0410
				[0.188]				[0.0561]
PrepayPen	0.257**	-0.408	0.257**	0.257**	-0.133***	-0.500***	-0.133***	-0.133***
	[0.129]	[0.270]	[0.130]	[0.129]	[0.0298]	[0.0897]	[0.0299]	[0.0298]
Balloon	0.633***	0.631***	0.104	0.633***	-0.0983	-0.0991	-0.344**	-0.0984
	[0.197]	[0.196]	[0.423]	[0.197]	[0.0880]	[0.0881]	[0.153]	[0.0881]
LowNoDoc	0.214*	0.214*	0.214*	0.361*	-0.0399	-0.0400	-0.0397	0.00113
	[0.112]	[0.111]	[0.112]	[0.216]	[0.0276]	[0.0276]	[0.0276]	[0.0601]
Log-Likelihood	-148,179	-148,163	-148,176	-148,179				
	APL = *FinancingPF*							
	Foreclosure				Prepayment			
APL	-0.181	-0.303**	-0.224*	-0.179	0.0294	0.00913	0.0186	0.00374
	[0.114]	[0.126]	[0.117]	[0.136]	[0.0327]	[0.0362]	[0.0328]	[0.0395]
APL**PrepayPen*		0.369				0.0689		
		[0.227]				[0.0682]		
APL**Balloon*			0.660*				0.209*	
			[0.373]				[0.126]	
APL**LowNoDoc*				-0.00592				0.0636
				[0.194]				[0.0563]
PrepayPen	0.258**	-0.113	0.257**	0.258**	-0.133***	-0.203***	-0.134***	-0.133***
	[0.129]	[0.262]	[0.129]	[0.129]	[0.0297]	[0.0758]	[0.0297]	[0.0297]
Balloon	0.634***	0.632***	-0.0196	0.634***	-0.105	-0.106	-0.312**	-0.105
	[0.196]	[0.196]	[0.417]	[0.196]	[0.0878]	[0.0879]	[0.155]	[0.0878]
LowNoDoc	0.215*	0.214*	0.215*	0.221	-0.0404	-0.0404	-0.0403	-0.104*
	[0.111]	[0.111]	[0.111]	[0.223]	[0.0276]	[0.0276]	[0.0276]	[0.0625]
Log-Likelihood	-148,185	-148,180	-148,182	-148,184				

Table 11b – Changes in the probability of a foreclosure start and a prepayment – APL provisions – refinance FRMs (continued)
This table presents results of multinomial logit regressions without unobserved heterogeneity based on monthly data for loans originated during 2002-2006. Specifications include the same control variables as in Table 8, plus APL provision variables and their interactions with *PrepayPen*, *PrepayPenEnd*, *Balloon*, and *LowNoDoc*. Variables are defined as in Tables 2 and 10. Each coefficient estimate represents the impact on the probability of a first foreclosure start or a prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Robust standard errors clustered by loan are in brackets. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	APL = *PrepayDur*				**APL = *PrepayAmt***			
	Foreclosure		Prepayment		Foreclosure		Prepayment	
APL	-0.242**	-0.374***	0.0135	-0.0593*	-0.272**	-0.427***	0.0940**	0.0375
	[0.0953]	[0.105]	[0.0300]	[0.0335]	[0.123]	[0.136]	[0.0400]	[0.0438]
APL**PrepayPen*		0.585***		0.336***		0.633**		0.282***
		[0.209]		[0.0728]		[0.255]		[0.0903]
PrepayPen	0.256**	-0.336	-0.133***	-0.470***	0.253**	-0.385	-0.133***	-0.416***
	[0.129]	[0.249]	[0.0296]	[0.0826]	[0.129]	[0.288]	[0.0298]	[0.0985]
Balloon	0.632***	0.633***	-0.106	-0.105	0.631***	0.629***	-0.100	-0.101
	[0.196]	[0.194]	[0.0878]	[0.0877]	[0.196]	[0.195]	[0.0880]	[0.0880]
LowNoDoc	0.215*	0.217**	-0.0405	-0.0404	0.214*	0.213*	-0.0399	-0.0401
	[0.111]	[0.110]	[0.0276]	[0.0276]	[0.111]	[0.111]	[0.0276]	[0.0277]
Log-Likelihood	-148,183	-148,167			-148,180	-148,171		

	APL = *PrepayNoPre*			
	Foreclosure		Prepayment	
APL	0.270	0.300	0.204***	0.242***
	[0.164]	[0.256]	[0.0496]	[0.0810]
APL* *PrepayPen*		-0.0447		-0.0599
		[0.308]		[0.0932]
PrepayPen	0.255**	0.300	-0.133***	-0.0731
	[0.129]	[0.335]	[0.0297]	[0.0971]
Balloon	0.651***	0.651***	-0.105	-0.105
	[0.197]	[0.197]	[0.0879]	[0.0879]
LowNoDoc	0.218*	0.218*	-0.0402	-0.0401
	[0.111]	[0.111]	[0.0276]	[0.0276]
Log-Likelihood	-148,175	-148,175		

	APL = *BalloonTerm*				**APL = *Verification***			
	Foreclosure		Prepayment		Foreclosure		Prepayment	
APL	-0.0367	-0.0925	0.0745*	0.0705*	-0.174	-0.157	0.119***	0.145**
	[0.138]	[0.139]	[0.0388]	[0.0383]	[0.139]	[0.169]	[0.0458]	[0.0564]
APL**Balloon*		1.262**		0.113				
		[0.605]		[0.197]				
APL**LowNoDoc*						-0.0484		-0.0752
						[0.264]		[0.0827]
PrepayPen	0.256**	0.257**	-0.133***	-0.133***	0.255**	0.255**	-0.133***	-0.133***
	[0.129]	[0.129]	[0.0296]	[0.0297]	[0.129]	[0.129]	[0.0298]	[0.0298]
Balloon	0.646***	-0.610	-0.104	-0.217	0.639***	0.639***	-0.0998	-0.0999
	[0.196]	[0.633]	[0.0877]	[0.219]	[0.197]	[0.197]	[0.0881]	[0.0881]
LowNoDoc	0.217*	0.217*	-0.0403	-0.0402	0.215*	0.215*	-0.0399	-0.0399
	[0.111]	[0.111]	[0.0275]	[0.0275]	[0.111]	[0.112]	[0.0276]	[0.0276]
Log-Likelihood	-148,184	-148,182			-148,181	-148,180		

Table 11b – Changes in the probability of a foreclosure start and a prepayment – APL provisions – refinance FRMs (continued)
This table presents results of multinomial logit regressions without unobserved heterogeneity based on monthly data for loans originated during 2002-2006. Specifications include the same control variables as in Table 8, plus APL provision variables and their interactions with *PrepayPen*, *PrepayPenEnd*, *Balloon*, and *LowNoDoc*. Variables are defined as in Tables 2 and 10. Each coefficient estimate represents the impact on the probability of a first foreclosure start or a prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Robust standard errors clustered by loan are in brackets. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	APL = *FlippingDur*					
	Foreclosure			Prepayment		
APL	-0.0831	-0.267*	-0.118	0.0164	-0.175***	0.0182
	[0.123]	[0.141]	[0.124]	[0.0369]	[0.0437]	[0.0368]
APL**PrepayPen*		0.551**			0.639***	
		[0.252]			[0.0890]	
APL**Balloon*			0.967			-0.0537
			[0.630]			[0.210]
PrepayPen	0.256**	-0.299	0.256**	-0.133***	-0.772***	-0.133***
	[0.129]	[0.286]	[0.129]	[0.0296]	[0.0982]	[0.0296]
Balloon	0.646***	0.647***	-0.319	-0.107	-0.104	-0.0537
	[0.196]	[0.194]	[0.657]	[0.0877]	[0.0878]	[0.230]
LowNoDoc	0.217*	0.218**	0.217*	-0.0405	-0.0396	-0.0405
	[0.111]	[0.111]	[0.111]	[0.0276]	[0.0276]	[0.0275]
Log-Likelihood	-148,186	-148,149	-148,185			
	APL = *OwnRefiPF*					
	Foreclosure			Prepayment		
APL	0.107	-0.0887	0.0628	0.0522	-0.0152	0.0454
	[0.170]	[0.192]	[0.173]	[0.0466]	[0.0510]	[0.0463]
APL**PrepayPen*		0.483			0.234**	
		[0.369]			[0.117]	
APL**Balloon*			0.753			0.174
			[0.624]			[0.227]
PrepayPen	0.254**	0.256**	0.255**	-0.133***	-0.133***	-0.133***
	[0.129]	[0.129]	[0.129]	[0.0296]	[0.0297]	[0.0297]
Balloon	0.650***	0.649***	0.652***	-0.106	-0.107	-0.106
	[0.196]	[0.196]	[0.196]	[0.0877]	[0.0878]	[0.0877]
LowNoDoc	0.218**	0.217*	0.218*	-0.0405	-0.0405	-0.0405
	[0.111]	[0.111]	[0.111]	[0.0276]	[0.0276]	[0.0276]
Log-Likelihood	-148,186	-148,179	-148,185			

Table 11c – Changes in the probability of a foreclosure start and a prepayment – APL provisions – purchase ARMs
This table presents results of multinomial logit regressions without unobserved heterogeneity based on monthly data for loans originated during 2002-2006. Specifications include the same control variables as in Table 8, plus APL provision variables and their interactions with *PrepayPen*, *PrepayPenEnd*, and *LowNoDoc*. Variables are defined as in Tables 2 and 10. Each coefficient estimate represents the impact on the probability of a first foreclosure start or a prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Robust standard errors clustered by loan are in brackets. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	APL = *TriggerAPR*					
	Foreclosure			Prepayment		
APL	0.0572	-0.0637	-0.0291	-0.317	-0.299	-0.425*
	[0.298]	[0.318]	[0.316]	[0.217]	[0.233]	[0.219]
APL**PrepayPen*		0.540			-0.180	
		[0.464]			[0.349]	
APL**LowNoDoc*			0.379			0.472
			[0.467]			[0.342]
PrepayPen	-1.483***	-1.481***	-1.481***	-1.916***	-1.914***	-1.915***
	[0.150]	[0.150]	[0.150]	[0.137]	[0.137]	[0.137]
LowNoDoc	0.327***	0.327***	0.327***	0.0308	0.0308	0.0305
	[0.0857]	[0.0857]	[0.0857]	[0.0526]	[0.0526]	[0.0526]
Log-Likelihood	-146,491	-146,489	-146,490			
	APL = *TriggerPF*					
	Foreclosure			Prepayment		
APL	-0.308**	-0.396**	-0.414***	0.172*	-0.281**	0.229**
	[0.123]	[0.180]	[0.145]	[0.0889]	[0.143]	[0.106]
APL**PrepayPen*		0.0297			0.979***	
		[0.232]			[0.202]	
APL**LowNoDoc*			0.288			-0.138
			[0.230]			[0.161]
PrepayPen	-1.471***	-1.516***	-1.472***	-1.919***	-2.926***	-1.918***
	[0.150]	[0.286]	[0.150]	[0.138]	[0.259]	[0.138]
LowNoDoc	0.319***	0.319***	0.0305	0.0322	0.0325	0.170
	[0.0858]	[0.0858]	[0.246]	[0.0527]	[0.0528]	[0.169]
Log-Likelihood	-146,483	-146,464	-146,481			
	APL = *FinancingPF*					
	Foreclosure			Prepayment		
APL	-0.0479	-0.392*	-0.204	0.139	0.0181	0.130
	[0.142]	[0.211]	[0.177]	[0.0915]	[0.147]	[0.114]
APL**PrepayPen*		0.686**			0.164	
		[0.268]			[0.186]	
APL**LowNoDoc*			0.324			0.0218
			[0.247]			[0.163]
PrepayPen	-1.481***	-2.171***	-1.480***	-1.917***	-2.081***	-1.916***
	[0.150]	[0.314]	[0.150]	[0.137]	[0.240]	[0.138]
LowNoDoc	0.327***	0.328***	0.00303	0.0324	0.0326	0.0105
	[0.0858]	[0.0859]	[0.261]	[0.0526]	[0.0526]	[0.171]
Log-Likelihood	-146,491	-146,485	-146,490			

Table 11c – Changes in the probability of a foreclosure start and a prepayment – APL provisions – purchase ARMs (continued)
This table presents results of multinomial logit regressions without unobserved heterogeneity based on monthly data for loans originated during 2002-2006. Specifications include the same control variables as in Table 8, plus APL provision variables and their interactions with *PrepayPen*, *PrepayPenEnd*, and *LowNoDoc*. Variables are defined as in Tables 2 and 10. Each coefficient estimate represents the impact on the probability of a first foreclosure start or a prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Robust standard errors clustered by loan are in brackets. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	APL = *PrepayDur*				**APL = *PrepayAmt***			
	Foreclosure		Prepayment		Foreclosure		Prepayment	
APL	-0.138	-0.181	-0.0789	-0.442***	-0.398***	-0.816***	0.240**	-1.001***
	[0.103]	[0.130]	[0.0764]	[0.103]	[0.147]	[0.268]	[0.110]	[0.250]
APL**PrepayPen*		-0.0957		1.129***		0.292		1.888***
		[0.204]		[0.174]		[0.315]		[0.302]
PrepayPen	-1.484***	-1.394***	-1.914***	-3.076***	-1.475***	-1.793***	-1.920***	-3.856***
	[0.150]	[0.261]	[0.137]	[0.234]	[0.150]	[0.370]	[0.138]	[0.361]
LowNoDoc	0.325***	0.323***	0.0295	0.0321	0.320***	0.320***	0.0313	0.0322
	[0.0858]	[0.0857]	[0.0526]	[0.0528]	[0.0857]	[0.0858]	[0.0526]	[0.0529]
Log-Likelihood	-146,491	-146,459			-146,481	-146,446		
	APL = *PrepayNoPre*				**APL = *Verification***			
	Foreclosure		Prepayment		Foreclosure		Prepayment	
APL	-0.0262	0.495	-0.193*	0.178	-0.962*	-0.575	-0.306	-0.143
	[0.179]	[0.412]	[0.112]	[0.300]	[0.551]	[0.585]	[0.423]	[0.512]
APL* *PrepayPen*		-0.750		-0.450				
		[0.457]		[0.337]				
APL**LowNoDoc*						-1.017		-0.399
						[0.882]		[0.703]
PrepayPen	-1.485***	-0.739	-1.918***	-1.469***	-1.485***	-1.484***	-1.916***	-1.915***
	[0.150]	[0.474]	[0.137]	[0.354]	[0.150]	[0.150]	[0.137]	[0.137]
LowNoDoc	0.328***	0.329***	0.0319	0.0323	0.328***	0.328***	0.0305	0.0304
	[0.0857]	[0.0858]	[0.0526]	[0.0526]	[0.0857]	[0.0857]	[0.0526]	[0.0526]
Log-Likelihood	-146,491	-146,488			-146,491	-146,490		
	APL = *FlippingDur*				**APL = *OwnRefiPF***			
	Foreclosure		Prepayment		Foreclosure		Prepayment	
APL	-0.0993	-0.131	-0.0618	-0.447***	-0.0158	-0.232	0.0732	0.102
	[0.105]	[0.134]	[0.0781]	[0.107]	[0.212]	[0.246]	[0.140]	[0.165]
APL* *PrepayPen*		-0.148		1.217***		0.775*		-0.329
		[0.212]		[0.184]		[0.458]		[0.344]
PrepayPen	-1.485***	-1.339***	-1.915***	-3.162***	-1.485***	-1.484***	-1.916***	-1.915***
	[0.150]	[0.267]	[0.137]	[0.241]	[0.150]	[0.150]	[0.137]	[0.138]
LowNoDoc	0.326***	0.323***	0.0297	0.0324	0.328***	0.328***	0.0309	0.0309
	[0.0858]	[0.0857]	[0.0526]	[0.0528]	[0.0857]	[0.0858]	[0.0526]	[0.0526]
Log-Likelihood	-146,492	-146,456			-146,492	-146,489		

Table 11d – Changes in the probability of a foreclosure start and a prepayment – APL provisions – refinance ARMs
This table presents results of multinomial logit regressions without unobserved heterogeneity based on monthly data for loans originated during 2002-2006. Specifications include the same control variables as in Table 8, plus APL provision variables and their interactions with *PrepayPen*, *PrepayPenEnd*, and *LowNoDoc*. Variables are defined as in Tables 2 and 10. Each coefficient estimate represents the impact on the probability of a first foreclosure start or a prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Robust standard errors clustered by loan are in brackets. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	APL = *TriggerAPR*					
	Foreclosure			Prepayment		
APL	-0.204**	-0.125	-0.273***	0.0923	0.0498	0.0780
	[0.0923]	[0.113]	[0.106]	[0.0604]	[0.0794]	[0.0683]
APL**PrepayPen*		-0.294*			0.104	
		[0.172]			[0.110]	
APL**LowNoDoc*			0.218			0.0528
			[0.164]			[0.108]
PrepayPen	-0.995***	-0.996***	-0.996***	-1.097***	-1.099***	-1.097***
	[0.186]	[0.186]	[0.186]	[0.141]	[0.141]	[0.141]
LowNoDoc	0.438***	0.437***	0.438***	-0.0499	-0.0497	-0.0499
	[0.0949]	[0.0949]	[0.0949]	[0.0527]	[0.0527]	[0.0527]
Log-Likelihood	-145,694	-145,690	-145,693			
	APL = *TriggerPF*					
	Foreclosure			Prepayment		
APL	-0.102	0.0174	-0.211**	0.269***	0.142**	0.248***
	[0.0830]	[0.102]	[0.0926]	[0.0533]	[0.0690]	[0.0591]
APL**PrepayPen*		-0.412***			0.329***	
		[0.144]			[0.0924]	
APL**LowNoDoc*			0.347**			0.0761
			[0.140]			[0.0889]
PrepayPen	-0.961***	-0.550**	-0.963***	-1.080***	-1.419***	-1.081***
	[0.183]	[0.236]	[0.183]	[0.138]	[0.171]	[0.139]
LowNoDoc	0.440***	0.437***	0.0925	-0.0418	-0.0410	-0.118
	[0.0946]	[0.0947]	[0.169]	[0.0524]	[0.0525]	[0.103]
Log-Likelihood	-145,681	-145,662	-145,677			
	APL = *FinancingPF*					
	Foreclosure			Prepayment		
APL	-0.0324	0.0511	-0.110	0.134**	0.110	0.0873
	[0.0840]	[0.106]	[0.0948]	[0.0535]	[0.0708]	[0.0596]
APL**PrepayPen*		-0.233*			0.0551	
		[0.137]			[0.0910]	
APL**LowNoDoc*			0.249*			0.161*
			[0.138]			[0.0896]
PrepayPen	-0.981***	-0.747***	-0.981***	-1.091***	-1.148***	-1.091***
	[0.185]	[0.233]	[0.185]	[0.140]	[0.169]	[0.140]
LowNoDoc	0.443***	0.441***	0.194	-0.0467	-0.0469	-0.208**
	[0.0948]	[0.0948]	[0.168]	[0.0526]	[0.0526]	[0.104]
Log-Likelihood	-145,696	-145,693	-145,694			

Table 11d – Changes in the probability of a foreclosure start and a prepayment – APL provisions – refinance ARMs (continued)
This table presents results of multinomial logit regressions without unobserved heterogeneity based on monthly data for loans originated during 2002-2006. Specifications include the same control variables as in Table 8, plus APL provision variables and their interactions with *PrepayPen*, *PrepayPenEnd*, and *LowNoDoc*. Variables are defined as in Tables 2 and 10. Each coefficient estimate represents the impact on the probability of a first foreclosure start or a prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Robust standard errors clustered by loan are in brackets. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	APL = *PrepayDur*				**APL = *PrepayAmt***			
	Foreclosure		Prepayment		Foreclosure		Prepayment	
APL	-0.205***	-0.190**	0.0210	-0.186***	-0.201**	-0.0923	0.211***	0.0364
	[0.0721]	[0.0906]	[0.0477]	[0.0658]	[0.0862]	[0.110]	[0.0566]	[0.0789]
APL**PrepayPen*		-0.230*		0.523***		-0.403***		0.406***
		[0.137]		[0.0931]		[0.155]		[0.103]
PrepayPen	-0.999***	-0.779***	-1.101***	-1.646***	-0.980***	-0.580**	-1.091***	-1.511***
	[0.187]	[0.238]	[0.141]	[0.177]	[0.185]	[0.247]	[0.140]	[0.180]
LowNoDoc	0.434***	0.430***	-0.0518	-0.0477	0.436***	0.433***	-0.0460	-0.0450
	[0.0950]	[0.0952]	[0.0528]	[0.0530]	[0.0948]	[0.0949]	[0.0526]	[0.0527]
Log-Likelihood	-145,694	-145,666			-145,683	-145,663		
	APL = *PrepayNoPre*				**APL = *Verification***			
	Foreclosure		Prepayment		Foreclosure		Prepayment	
APL	-0.177	-0.293	0.0278	0.441***	-0.207**	-0.292***	0.117*	0.104
	[0.113]	[0.219]	[0.0675]	[0.165]	[0.0934]	[0.106]	[0.0613]	[0.0690]
APL* *PrepayPen*		0.238		-0.518***				
		[0.257]		[0.191]				
APL**LowNoDoc*						0.272		0.0498
						[0.169]		[0.111]
PrepayPen	-1.008***	-1.239***	-1.101***	-0.581**	-0.991***	-0.992***	-1.095***	-1.096***
	[0.186]	[0.317]	[0.141]	[0.237]	[0.186]	[0.186]	[0.141]	[0.141]
LowNoDoc	0.443***	0.443***	-0.0518	-0.0516	0.438***	0.438***	-0.0492	-0.0493
	[0.0948]	[0.0948]	[0.0527]	[0.0527]	[0.0949]	[0.0949]	[0.0527]	[0.0527]
Log-Likelihood	-145,698	-145,691			-145,692	-145,691		
	APL = *FlippingDur*				**APL = *OwnRefiPF***			
	Foreclosure		Prepayment		Foreclosure		Prepayment	
APL	-0.101	-0.206	-0.0289	-0.473***	0.139	0.0751	0.293***	0.271**
	[0.0997]	[0.126]	[0.0652]	[0.0916]	[0.157]	[0.189]	[0.0966]	[0.116]
APL* *PrepayPen*		0.0401		1.152***		0.231		-0.0390
		[0.198]		[0.145]		[0.353]		[0.214]
PrepayPen	-1.004***	-1.054***	-1.101***	-2.279***	-0.990***	-0.982***	-1.089***	-1.082***
	[0.186]	[0.280]	[0.141]	[0.213]	[0.184]	[0.184]	[0.139]	[0.138]
LowNoDoc	0.441***	0.440***	-0.0523	-0.0486	0.445***	0.446***	-0.0489	-0.0487
	[0.0949]	[0.0949]	[0.0527]	[0.0530]	[0.0947]	[0.0946]	[0.0525]	[0.0524]
Log-Likelihood	-145,700	-145,658			-145,696	-145,694		

Table 12a – Numbers of differences in coefficient estimates of MSA-loan feature interaction terms in pooled MSA regressions with APL provisions – foreclosure equations
This table lists, for each regression from Tables 11a-11d, the numbers of MSA pairs that exhibit coefficient estimates for interaction variables of MSA indicators and *PrepayPen*, *Balloon*, or *LowNoDoc* such that (1) the combined estimated impacts of the loan feature variable and the MSA-loan feature interaction variable have opposite signs and (2) the MSA-loan feature interaction variables are different at the 10% level of significance or greater. These coefficient estimate differences are based on the foreclosure equation results from Tables 11a-11d. Differences based on the prepayment equation results from Tables 11a-11d are presented in Table 12b. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Based on foreclosure equation results from Tables 11a-11d									
	Purchase FRMs			**Refinance FRMs**			**Purchase ARMs**		**Refinance ARMs**	
	MSA PrepayPen*	*MSA* Balloon*	*MSA* LowNoDoc*	*MSA* PrepayPen*	*MSA* Balloon*	*MSA* LowNoDoc*	*MSA* PrepayPen*	*MSA* LowNoDoc*	*MSA* PrepayPen*	*MSA* LowNoDoc*
No APL variable (Tables 9a-9b)	21	13	0	8	9	0	0	0	0	0
TriggerAPR	21	13	0	8	9	0	0	0	0	0
*TriggerAPR and TriggerAPR*PrepayPen*	18	13	0	8	8	0	0	0	6	0
*TriggerAPR and TriggerAPR*Balloon*	21	15	0	8	8	0				
*TriggerAPR and TriggerAPR*LowNoDoc*	21	13	0	8	9	0	0	0	0	0
TriggerPF	21	10	0	8	9	0	0	0	0	0
*TriggerPF and TriggerPF*PrepayPen*	8	13	0	0	8	0	0	0	12	0
*TriggerPF and TriggerPF*Balloon*	21	14	0	8	9	0				
*TriggerPF and TriggerPF*LowNoDoc*	21	10	0	8	9	0	0	0	0	0
FinancingPF	21	13	0	8	9	0	0	0	0	0
*FinancingPF and FinancingPF*PrepayPen*	12	8	0	0	9	0	0	0	5	0
*FinancingPF and FinancingPF*Balloon*	5	13	0	8	6	0				
*FinancingPF and FinancingPF*LowNoDoc*	21	13	0	8	9	0	0	0	0	0
PrepayDur	21	10	0	8	9	0	0	0	0	0
*PrepayDur and PrepayDur*PrepayPen*	8	13	0	0	9	0	0	0	9	0
PrepayAmt	21	13	0	8	9	0	0	0	0	0
*PrepayAmt and PrepayAmt*PrepayPen*	12	13	0	0	8	0	0	0	19	0
PrepayNoPre	21	13	0	8	9	0	0	0	0	0
*PrepayNoPre and PrepayNoPre*PrepayPen*	24	13	0	5	9	0	3	0	0	0
BalloonTerm	21	10	0	8	9	0				
*BalloonTerm and BalloonTerm*Balloon*	21	10	0	8	3	0				
Verification	21	13	0	8	9	0	0	0	0	0
*Verification and Verification*LowNoDoc*	21	13	0	8	9	0	0	0	0	0
FlippingDur	21	10	0	8	9	0	0	0	0	0
*FlippingDur and FlippingDur*PrepayPen*	14	13	0	0	9	0	0	0	0	0
*FlippingDur and FlippingDur*Balloon*	21	12	0	8	4	0				
OwnRefiPF	21	13	0	8	9	0	0	0	0	0
*OwnRefiPF and OwnRefiPF*PrepayPen*	15	13	0	8	9	0	0	0	0	0
*OwnRefiPF and OwnRefiPF*Balloon*	21	15	0	8	11	0				

Table 12b – Numbers of differences in coefficient estimates of MSA-loan feature interaction terms in pooled MSA regressions with APL provisions – prepayment equations
This table lists, for each regression from Tables 11a-11d, the numbers of MSA pairs that exhibit coefficient estimates for interaction variables of MSA indicators and *PrepayPen*, *Balloon*, or *LowNoDoc* such that (1) the combined estimated impacts of the loan feature variable and the MSA-loan feature interaction variable have opposite signs and (2) the MSA-loan feature interaction variables are different at the 10% level of significance or greater. These coefficient estimate differences are based on the prepayment equation results from Tables 11a-11d. Differences based on the foreclosure equation results from Tables 11a-11d are presented in Table 12a. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Based on prepayment equation results from Tables 11a-11d									
	Purchase FRMs			**Refinance FRMs**			**Purchase ARMs**		**Refinance ARMs**	
	MSA PrepayPen*	*MSA* Balloon*	*MSA* LowNoDoc*	*MSA* PrepayPen*	*MSA* Balloon*	*MSA* LowNoDoc*	*MSA* PrepayPen*	*MSA* LowNoDoc*	*MSA* PrepayPen*	*MSA* LowNoDoc*
No APL variable (Tables 9a-9b)	0	8	15	0	0	11	0	14	0	13
TriggerAPR	0	8	15	0	0	12	0	13	0	13
*TriggerAPR and TriggerAPR*PrepayPen*	0	8	15	0	0	12	0	13	0	13
*TriggerAPR and TriggerAPR*Balloon*	0	10	15	0	0	12				
*TriggerAPR and TriggerAPR*LowNoDoc*	0	8	13	0	0	9	0	16	0	9
TriggerPF	0	8	15	0	0	12	0	13	0	12
*TriggerPF and TriggerPF*PrepayPen*	0	10	15	0	0	12	0	13	0	12
*TriggerPF and TriggerPF*Balloon*	0	0	15	0	0	12				
*TriggerPF and TriggerPF*LowNoDoc*	0	8	16	0	0	9	0	14	0	10
FinancingPF	0	8	15	0	0	12	0	14	0	13
*FinancingPF and FinancingPF*PrepayPen*	0	4	15	0	0	12	0	13	0	13
*FinancingPF and FinancingPF*Balloon*	0	7	15	0	0	12				
*FinancingPF and FinancingPF*LowNoDoc*	0	8	17	0	0	13	0	11	0	4
PrepayDur	0	8	15	0	0	11	0	14	0	13
*PrepayDur and PrepayDur*PrepayPen*	0	9	14	0	0	12	0	13	0	12
PrepayAmt	0	8	15	0	0	12	0	13	0	13
*PrepayAmt and PrepayAmt*PrepayPen*	0	8	14	0	0	12	0	14	0	13
PrepayNoPre	0	8	15	0	0	12	0	14	0	13
*PrepayNoPre and PrepayNoPre*PrepayPen*	9	8	15	0	0	11	0	14	0	13
BalloonTerm	0	8	15	0	0	12				
*BalloonTerm and BalloonTerm*Balloon*	0	0	15	0	0	12				
Verification	0	8	15	0	0	12	0	14	0	13
*Verification and Verification*LowNoDoc*	0	8	15	0	0	8	0	14	0	9
FlippingDur	0	8	15	0	0	12	0	14	0	13
*FlippingDur and FlippingDur*PrepayPen*	0	9	14	0	0	11	0	13	0	12
*FlippingDur and FlippingDur*Balloon*	0	0	15	0	0	12				
OwnRefiPF	0	8	15	0	0	12	0	14	0	12
*OwnRefiPF and OwnRefiPF*PrepayPen*	0	8	15	0	0	12	0	14	0	12
*OwnRefiPF and OwnRefiPF*Balloon*	0	4	15	0	0	12				

Endnotes

[1] HOEPA defines "high-cost loans" as loans in which either the APR exceeds the yield on comparable Treasury securities plus 8% for first lien mortgages (10% for subordinate liens) or the total points and fees exceed the greater of 8% of the total loan amount or an annually indexed dollar figure ($579 in 2010). In addition to the prohibition of all prepayment penalties five years after origination, prepayment penalties are prohibited entirely on loans in which the borrower's total monthly debts exceed 50% of the borrower's monthly gross income.

[2] Under the amendment to Regulation Z, a first-lien loan is "higher-priced" if its APR is 1.5 percentage points higher than the "average prime offer rate" determined by a Freddie Mac mortgage rate survey. For subordinate liens, the APR threshold is 3.5 percentage points. See Federal Reserve Board (2008).

[3] Mayer and Pence (2008) compare the LoanPerformance data's coverage of subprime origination to the coverage of two other sources, loans originated by lenders appearing on the list of subprime lenders maintained by the Department of Housing and Urban Development and higher-priced loans identified since 2004 in data collected under the auspices of the Home Mortgage Disclosure Act. The authors conclude that during the mid-2000s, the LoanPerformance data likely provides the most reliable coverage of subprime originations.

[4] Population figures are from the July 1, 2007 estimates of the U.S. Census Bureau. The highest population MSA from each decile included two California MSAs (Los Angeles and Riverside) and two MSAs covering parts of New Jersey (New York City and Newark). In each case, the lower-population MSA (Riverside and Newark) were replaced by the next most populous MSA in that decile (Miami and San Antonio, respectively).

[5] A 50 percent random sample was taken from each MSA for purchase FRMs, a 20 percent random sample for refinance FRMs and purchase ARMs, and a 10 percent random sample for refinance ARMs.

[6] Deng *et al.* (2005) include a similar variable but use the market rate at the time a loan was originated instead of the loan interest rate, with the rationale that the loan interest rate includes any risk premium or discount specific to the borrower which might be incorporated into the interest rate of a subsequent refinancing as well. When I replace *RefiPremium* with a similar variable using the market rate at origination, the results do not substantially differ.

[7] Following Pennington-Cross and Ho (2010), *PaymentAdj* is constrained to be non-negative and equals zero prior to a loan's first scheduled rate reset. When I replace *PaymentAdj* with a similar variable without those constraints, that variable is positively related to the probability of foreclosure but negatively related to the probability of prepayment. This might be due to the introduction into the variable of loan modifications, the likeliest sources of reductions in monthly payments prior to a loan's first scheduled rate reset. A loan modification may be a temporary step until a distressed borrower can either refinance into a more affordable mortgage or sell his or her house, suggesting a positive relationship between loan modifications and prepayments. Replacing *PaymentAdj* with the altered variable noticeably changes the magnitudes of *Adj1st* and *PostAdj1st*, but other variables are largely unaffected.

[8] The Clapp *et al.* (2006) model includes a separate indicator variable for every time period since loan origination, which for this paper's sample would require more than eighty additional variables. To reduce the computational burden, the model used here replaces the monthly indicators with indicators for each loan's origination year and variables for loan age (months

since origination) and its square. The specifications here also include more time-varying explanatory variables than the specifications in Clapp *et al.* (2006).

[9] When specifications were run assuming three groups, very frequently two of the three were not significantly different from each other, and convergence problems became rampant.

[10] Results based on alternative definitions of foreclosure are discussed in the next section.

[11] For example, the times required for each of the specifications with unobserved heterogeneity in Table 4 was approximately three orders of magnitude greater than the times required for similar specifications without unobserved heterogeneity (using Stata 11). Gerardi *et al.* (2009) eschew incorporating unobserved heterogeneity into their proportional hazard model for their full samples specifically due to it being "extremely computationally burdensome," and find no substantial differences in their results when they did so for very small subsets of their data (see their footnote 9).

[12] The individual MSA specifications that did not converge are noted in the captions of Tables 6a-6b. Complete results of all constant heterogeneity weight specifications are available in a supplement at http://www.umbc.edu/economics/wpapers/wp_10_119.pdf.

[13] Several researchers use a proportional hazard model that controls for unobserved heterogeneity to examine competing mortgage risks (see Deng *et al.* (2000), Clapp *et al.* (2006), Pennington-Cross and Ho (2010)). I do not use such a model here due to the time consideration described above. Clapp *et al.* (2006) use mortgage termination data to compare results using a standard MNL model, an MNL model with unobserved heterogeneity, a standard proportional hazard model, and a proportional hazard model with unobserved heterogeneity. They find similar results across the four models.

[14] For a given coefficient estimate β, the percentage change in the probability of foreclosure or prepayment, relative to the probability of a loan remaining active, associated with a one-unit change in the explanatory variable is calculated as $e^{\beta} - 1$. For example, the -0.145 shown for *PrepayPen* in the first column of Table 4 implies a relative change in the probability of a first foreclosure start of $e^{(-0.145)} - 1 = -0.13498$, a 13.5 percent decrease.

[15] Recall that the dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications.

[16] LaCour-Little and Yang (2010) proxy for the likelihood that a borrower exaggerated his or her income with the ratio of the income on the loan application to the median income in the borrower's MSA. They find that this measure is positively related to default risk, and that the relationship is stronger for stated-income loans relative to fully documented loans. Income exaggeration can qualify a borrower for a larger loan than a borrower would otherwise be able to acquire, and so could be consistent with a high value for *RelLoanSize*.

[17] *Probability1* is calculated as $e^{(Prob.\ Coeff.)}/(e^{(Prob.\ Coeff.)}+1)$, so *Prob. Coeff.* = 0 implies *Probability1* = 50 percent.

[18] See Breslow (1970) and Gehan (1965).

[19] Complete results of all specifications in these and subsequent tables are available in a supplement at http://www.umbc.edu/economics/wpapers/wp_10_119.pdf.

[20] Note that, as an example, the sum of the coefficient estimates of *PrepayPen* and *Miami*PrepayPen* could have a different sign than the sum of the coefficient estimates of *PrepayPen* and *Atlanta*PrepayPen* even if the coefficient estimates of *Miami*PrepayPen* and *Atlanta*PrepayPen* have the same sign.

[21] The sample average initial loan interest rates are 7.01 percent for purchase FRMs, 6.95 percent for refinance FRMs, 6.86 percent for purchase ARMs, and 6.50 percent for refinance ARMs.

[22] In the *TriggerAPR* specifications for purchase FRMs in Table 11a, the coefficient estimate for APL**Balloon* is extremely high (15.25), and the estimate for *Minneapolis***Balloon* (unreported, but available in the supplement at http://www.umbc.edu/economics/wpapers/wp_10_119.pdf) is extremely low (-16.14). Minnesota is one of only two sample states for which *TriggerAPR* equals one for purchase loans at any point during the sample period. It equals one for Minnesota during the entire sample period, and equals one for Georgia for only six months. All other APL provisions examined here show greater variation across states over the sample period.

[23] Dropping *Judicial* from the specifications does not substantively affect the results.

[24] Inclusion of the deficiency judgment variable introduces collinearity because in each sample MSA that includes portions of two states, both states take the same value for that variable. The same is not true for *Judicial*.