

Mortgage Modification and Strategic Default: Evidence from a Legal Settlement with Countrywide (Preliminary Version)

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Abstract

In this paper we explore the possibility that homeowners respond strategically to news of mortgage modification programs. We exploit plausibly exogenous variation in modification policy induced by state government lawsuits against Countrywide Financial Corporation, one of the largest originators and servicers of subprime mortgages. A settlement of that litigation, announced in October 2008, required Countrywide to offer modifications to all seriously delinquent or near-delinquent homeowners with subprime mortgages throughout the country. In a difference-in-difference framework—after controlling for time-varying credit scores, combined loan-to-value ratios, interest rates, and other characteristics that do not differ substantially between loans serviced by Countrywide and those serviced by other institutions—we find that Countrywide’s relative delinquency rate increased substantially (thirteen percent per month) during the months immediately after public announcement of the settlement. This effect is present among subprime loans serviced by Countrywide, but absent among Countrywide-serviced loans that were not targeted by the settlement. We find that the borrowers most likely to default after the public announcement were the borrowers least likely to default otherwise, including borrowers with low current CLTVs and those with substantial liquidity available through their credit cards. These results suggest that strategic behavior is an important consideration in designing mortgage modification programs.

1 Introduction

Nearly five million homeowners lost their homes to foreclosure during the past three years. An additional fifteen million homeowners—more than one in three with a mortgage—are at risk of foreclosure because their homes are worth less than what they owe to mortgage lenders.¹ President Obama has made foreclosure prevention one of the key economic goals of his administration and implemented policies that encourage private lenders to reduce the monthly payments owed by struggling homeowners.² The centerpiece of these policies is the Home Affordable Mortgage Program (HAMP), to which the government has committed \$75 billion and extensive human resources.³ This program has been viewed as a failure relative to its original ambitions. Only 340,000 borrowers received permanent modifications in the first fifteen months following the program’s launch in March 2009, far fewer than the millions of modifications that government officials had hoped for.⁴ A report by the Treasury’s Inspector General for the Troubled Asset Relief Program (TARP) suggests that the HAMP “has been oversold by the Treasury Department and is likely to be a failure when it wraps up in 2012.”⁵

It is understandably difficult to develop a cost-effective mortgage modification program because of the difficulty in identifying precisely which borrowers might eventually default without modification. While more than 5.6 million borrowers are at least sixty-days delinquent, many more are current on their mortgages, including the vast majority of borrowers whose mortgage balances exceed the values of their

¹“U.S. Loan Effort Is Seen as Adding to Housing Woes,” *The New York Times*, 1/2/2010, p. A1.

²We note that in times of adverse economic conditions, debt forgiveness and loan modification can create value for both borrowers and lenders (see, Bolton and Rosenthal, 2002; Kroszner, 2003; and Piskorski and Tchisty, 2010). Moreover, because foreclosures may exert significant negative externalities, such as negative neighborhood effects (Campbell *et al.*, 2009), it might be socially optimal to modify mortgage contracts to a greater extent than lenders would select independently.

³A newer program based on encouraging banks to reduce principal balances was announced in Spring 2010, but it is too early to find evidence of its success.

⁴Housingwire.com; <http://www.housingwire.com/2010/06/21/total-number-of-hamp-permanent-modifications-passes-340000-2>

⁵“Home Loan Modification Program Oversold: Watchdog,” *Reuters*, 3/23/2010.

homes. Conditioning the availability of mortgage modifications on borrower delinquency has the risk of encouraging more borrowers to miss their payments in order to qualify for a modification. Recent reports suggest that about a quarter of those whose mortgages are seriously delinquent remain current on all other sources of credit, suggesting that strategic considerations rather than economic necessity are already driving many mortgage defaults.⁶

Lenders and policymakers are well aware of this strategic behavior problem, but nevertheless often target mortgage modifications to seriously delinquent borrowers because they perceive it to be costly to become delinquent. For example, seriously delinquent borrowers face higher costs of accessing liquidity through credit cards, auto loans, and any new mortgages or refinancings. Additionally, bounded rationality or moral considerations may decrease borrower ability or willingness to behave strategically.⁷ As a result, the extent of strategic behavior generated by existing mortgage modification programs is an important empirical question in determining how to efficiently reduce potential foreclosures going forward.

In this paper we quantify the extent of strategic behavior generated by a recent modification program that extends benefits to borrowers who have missed at least two months of mortgage payments (at least “sixty days past due”). We do this by studying litigation brought during Summer 2008 by eleven state attorneys general against Countrywide Financial Corporation, which allegedly engaged in widespread deceptive lending practices. As part of a Settlement, announced publicly in October 2008, Countrywide agreed to implement a mortgage modification program for

⁶Authors’ calculations based on borrowers who become at sixty days delinquent on their mortgage and do not miss any credit card payments for the following six months for our sample period, described below. Experian-Oliver Wyman Market Intelligence Reports provide similar estimates for 2006 to 2008. Using survey data, Guiso, Sapienza, and Zingales (2009) find that 17 percent of homeowners would default, even if they could afford to pay their mortgages, if their home values fell to levels where the homes were worth less than 50 percent of the homeowners’ mortgage debts.

⁷The evidence presented by Guiso, Sapienza, and Zingales (2009) suggests that moral and social considerations importantly affect household default decisions.

Countrywide-serviced, subprime mortgages.⁸ A centerpiece of this Settlement was Countrywide’s commitment to offer expedited, unsolicited loan modifications to borrowers who were at least sixty days delinquent.

The widespread scope of the Countrywide program, and its requirement that a borrower be delinquent in order to receive benefits, makes it a potentially useful experiment that could provide insight into borrower behavior in response to other modification programs. Many, including the IndyMac/FDIC program, JP Chase Enhanced Program, Citi Homeownership Preservation Program, and GSE Streamlined Modification Program, have also primarily targeted seriously delinquent borrowers.⁹

We identify strategic responses to public announcement of the Countrywide Settlement using an extensive dataset with information about all privately securitized mortgages, including the name of the servicer, origination mortgage amount and interest rate, origination FICO, and monthly payment history. We match data on these securitized mortgages to borrower data supplied by Equifax, one of the three major credit bureaus. The borrower data include credit scores as well as payment histories and utilization rates for credit cards, mortgages, second liens, and other sources of credit. These unique data allow us to track homeowner credit behavior during the months before and after an initial default on a mortgage.

In this paper, we say that a borrower exhibits “strategic behavior” if he or she defaults in response to public announcement of the Settlement and would not have defaulted otherwise, at least in the near term. Of course, it is difficult to observe the counterfactual—what a borrower might have done absent the Settlement announcement. We address this problem in three ways.

First, we estimate the number of additional defaults among Countrywide borrowers during the months immediately following the Settlement announcement

⁸Although Countrywide had recently been acquired by Bank of America, the Settlement applied only to Countrywide mortgages.

⁹See “A Brief (And Complete) History of Loan Modifications,” Citigroup, 2009.

relative to the number of additional defaults during the same period among comparable borrowers who had similar mortgages but were unaffected by the Settlement because their loans were not serviced by Countrywide (the “Control Group”). This provides a potential estimate of the frequency with which a borrower might have missed payments *because of* the Settlement announcement.

Second, we investigate the Settlement’s effects in a cross-section of borrowers with (i) greater access to liquidity through credit cards and (iii) lower current combined loan-to-value (CLTV) ratios. These borrowers were arguably less likely to default in the near term because they had significant untapped liquidity through their credit cards or some positive equity in their homes.

Third, to provide greater confidence that the Settlement announcement *caused* the relative increase in delinquencies among Countrywide loans, we investigate the Settlement’s effects in a subset of Countrywide-serviced loans that were not targeted by the Settlement.

Our initial analysis focuses on hybrid adjustable-rate mortgages (ARMs)—namely, 2/28s and 3/27s—which were largely aimed at subprime borrowers.¹⁰ The Countrywide settlement provided an automatic extension of the initial teaser rate to all subprime ARMs that were current before the teaser rate expired and became sixty-days delinquent immediately afterward.¹¹ We show that Countrywide’s loans were comparable to loans of other servicers prior to announcement of the Settlement. Comparing the two groups, we study the likelihood that a mortgage rolls from current to sixty days delinquent before and after the Settlement announcement.

In difference-in-difference specifications that control for many borrower attributes, including current credit scores and indebtedness, we find a thirteen

¹⁰The 2/28 and 3/27 hybrid loans are mortgages that carry a lower introductory “teaser” rate for the first two or three years, after which the rate typically resets to a higher, fully indexed level, for the remaining 28 or 27 years of the loan term.

¹¹Section 2 describes the terms of the Settlement and the qualification requirements for automatic modifications.

percent increase in the overall probability that Countrywide Hybrid ARMs loans roll straight from current to sixty days delinquent during the three months immediately after the settlement announcement (relative to a control group of loans with non-Countrywide servicers). Because these are hybrid mortgages, however, there is a potential confound: interest rates will potentially reset after the first two years of maturity, and they will be resetting at different dates for loans originated at different times. Although our baseline regressions include not only dummies that identify loans that are within three or six months of their reset date, but also loan-level controls that measure the magnitude of any interest rate reset, we rerun our regressions separately for each group of loans originated in the same calendar quarter. We find that the the effects of the Settlement are present in cohorts that were not resetting around the Settlement Announcement. This helps alleviate the concern that the effects of the Settlement are driven by unobservable differences between loans serviced by Countrywide and those serviced by other institutions around the time that the loans are resetting.¹²

When we stratify the sample by credit utilization and current CLTV, we find that the Settlement's effects were largest among Countrywide homeowners (relative to the Control Group) who had access to substantial liquidity through credit cards and those with relatively low current CLTV ratios. Although these homeowners were the least vulnerable to economic shocks, the delinquency rate among these borrowers increased substantially relative to the Control Group after the announcement of the settlement. These results point to significant strategic behavior among homeowners in response to the Settlement.

Finally, to alleviate further any concerns about our identification strategy, we look at the behavior of borrowers with fixed-rate mortgages (FRMs). The Settlement provided potential relief for delinquent borrowers with subprime FRMs. But unlike

¹²Note that our specifications do control for the magnitude of the reset in the interest rate.

hybrid mortgages, which were predominantly a subprime product, many FRMs were extended to so-called prime borrowers with good credit and higher down payments. Because the Settlement applied only to subprime mortgages, we would not expect to observe a greater post-Settlement increase in delinquencies among higher-quality (non-subprime) borrowers with Countrywide FRMs than among comparable borrowers with FRMs serviced by other institutions. This is exactly what the analysis shows. Countrywide FRMs with an initial FICO below 620 had a substantial relative increase in defaults immediately after the settlement announcement, while Countrywide FRMs with an initial FICO above 620 had no increase in delinquencies (the coefficient is negative and economically small).

Our results connect to several literatures. Previous studies of incentives, strategic behavior, and the financial crisis have examined a number of questions, including the impact of bailouts on banks' incentives to take risk,¹³ the likelihood that some lenders originated mortgages with greater risk due to their ability to sell the loans in the securitized market,¹⁴ and the impact of securitization on servicer decisions to foreclose delinquent loans.¹⁵ Little attention has been given so far to strategic behavior among homeowners.¹⁶ Our analysis is also related to the recent empirical literature examining household motives behind mortgage defaults (see, among others, Foote *et al.* [2008], Guiso *et al.* [2009], and Elul *et al.* [2010]), and more broadly to the household finance literature (see Tufano [2009] for a recent survey).

¹³See Farhi and Tirole (2009) and Poole (2009), for example.

¹⁴Keys, et al. (2010a, b), Mian and Sufi (2009), and Berndt and Gupta (2009) provide evidence suggesting that originators might have made riskier loans when they were able to securitize these loans.

¹⁵Piskorski, Seru, and Vig (2010) show that bank-held delinquent loans were foreclosed at a lower rate relative to comparable mortgages that were securitized.

¹⁶Moral hazard and strategic behavior has received sustained attention in other contexts, including health and unemployment insurance. In the context of unemployment insurance, Meyer (1990) and Moffitt (1985) show that a 10 percent increase in unemployment benefits leads to 4 to 8 percent longer duration of unemployment. Nonetheless, Chetty (2008) argues that liquidity constraints on the part of the unemployed contribute more than moral hazard in explaining the empirical evidence on the elasticity of unemployment duration relative to benefits.

Our paper is organized as follows. In Section 2 we describe the Countrywide Settlement and our hypotheses regarding the Settlement’s effects on homeowner behavior. Section 3 presents our data and empirical methodology. Section 4 describes our results. We discuss the implications of these results for the design of mortgage modification policies in the concluding Section 5.

2 Countrywide Settlement and Hypotheses

2.1 The Settlement

In June 2008, attorneys general in California and Illinois brought suit against Countrywide, alleging deceptive lending practices.¹⁷ The California complaint, for example, alleged that Countrywide

“implemented [a] deceptive scheme through misleading marketing practices designed to sell risky and costly loans to homeowners, the terms and dangers of which they did not understand, including by (a) advertising that it was the nation’s largest lender and could be trusted by consumers; (b) encouraging borrowers to refinance or obtain purchase money financing with complicated mortgage instruments like hybrid adjustable rate mortgages or payment option adjustable rate mortgages that were difficult for consumers to understand; (c) marketing these complex loan products to consumers by emphasizing the very low initial “teaser” or “fixed” rates while obfuscating or misrepresenting the later steep monthly payments and interest rate increases or risk of negative amortization; and (d) routinely soliciting borrowers to refinance only a few months after Countywide or the loan brokers with whom it had ‘business partnerships’ had sold them loans.” (Page 5 of complaint)

Within days, similar suits were brought by attorneys general in nine other states.¹⁸

¹⁷See <http://www.bloomberg.com/apps/news?pid=20601087&sid=aEsd2SRYtj7A>;
http://ag.ca.gov/cms_attachments/press/pdfs/n1582_draft_cwide_complaint2.pdf;
http://www.illinoisattorneygeneral.gov/pressroom/2008_06/countrywide_complaint.pdf.

¹⁸See <http://www.law.com/jsp/PubArticle.jsp?id=1202426289950>.

Countrywide entered a multi-state Settlement on October 6, 2008.¹⁹ Though the Settlement formally included only eleven states, other states were expected to join it,²⁰ and did.²¹ From the beginning, Countrywide has applied the terms of the Settlement nationally.²²

Pursuant to the Settlement, Countrywide has agreed to modify subprime loans²³ that it services and that are at risk of default. It is irrelevant whether the loan was originated by Countrywide, whether it is securitized or held in Countrywide's portfolio,²⁴ whether it previously received a modification, and whether the borrower's home is encumbered by a second mortgage or junior lien.

The Settlement targets three kinds of subprime mortgages currently serviced by Countrywide: Hybrid ARMs, Option ARMs, and FRMs. To qualify for modification, the mortgage and borrower must satisfy four criteria, which are summarized in Table 1:

¹⁹See <http://www.ct.gov/ag/lib/ag/consumers/finalmultistatefcsettlementtermsheet.pdf>; <http://www.bloomberg.com/apps/news?pid=newsarchive&sid=aEasVHGtwC9A>. Copies of the formal settlements filed in California and Illinois are available here and here: http://ag.ca.gov/cms_attachments/press/pdfs/n1618.cw_judgment.pdf; http://illinoisattorneygeneral.gov/consumers/countrywide_final_judgement.pdf.

²⁰See <http://www.cbsnews.com/stories/2008/10/06/business/main4503045.shtml>.

²¹See <http://www.housingwire.com/2009/01/14/virginia-joins-countrywide-settlement/>.

²²See this press release, which describes the Settlement as a nationwide program: http://www.nationalmortgagenetwork.org/pdfs/market_conditions/Countrywide_percent5B1percent5D.Settlement.Facts.pdf.

²³The Settlement defined "Subprime Mortgage Loans" as "first-lien residential mortgage loans that (a) combine higher risk features (such as low or no documentation, low equity, adjustable interest rates, prepayment penalties, cash-out financing) with higher risk borrower profiles (lower FICO scores, recent bankruptcies/foreclosures, major derogatory credit), resulting in a loan that could not reasonably be underwritten and approved as a 'prime' loan. An existing [Countrywide] Residential Mortgage Loan would be a 'Subprime Mortgage Loan' if it is identified as such in connection with a securitization in which it is part of the pool of securitized assets or, in the case of a [Countrywide] Residential Mortgage Loan that is not included in a securitization, was classified as being 'subprime' on the systems of [Countrywide] and its subsidiaries on June 30, 2008. 'Subprime Mortgage Loans' do not include first-lien residential mortgage loans that are Federal Eligible." See, e.g., California Settlement, page 5 (http://ag.ca.gov/cms_attachments/press/pdfs/n1618.cw_judgment.pdf).

²⁴Although securitization agreements often limit the servicer's authority to modify mortgages (Mayer, Morrison, and Piskorski 2009), Countrywide stated, "it currently has, or reasonably expects to obtain, discretion to pursue the foreclosure avoidance measures outlined in this agreement for the substantial majority of Qualifying Mortgages. Where [Countrywide] does not enjoy discretion to pursue these foreclosure avoidance measures, [Countrywide] will use its best effort to seek appropriate authorization from investors." See Multi-State Settlement, page 4, note 3 (<http://www.ct.gov/ag/lib/ag/consumers/finalmultistatefcsettlementtermsheet.pdf>).

- The loan must have originated before 2008 and have been within Countrywide’s servicing portfolio on June 30, 2008.
- The borrower’s loan-to-value ratio (LTV) must be at least seventy-five.
- Payments of principal or interest must be sixty or more days delinquent or likely to become delinquent as a result of an interest rate reset or negative amortization trigger.
- After modification, the borrower’s mortgage payments must not exceed forty-two percent of income (or thirty-four percent among borrowers for whom taxes and insurance are not escrowed).

Countrywide’s obligations vary by mortgage (and are summarized in Table 2). With respect to *Subprime Hybrid ARMs*, its obligations depend on when the mortgages became delinquent. Borrowers with these mortgages should receive *unsolicited* restoration of the introductory interest rate for five years if they were current prior to their first rate reset and became sixty days delinquent immediately afterwards. Countrywide must offer this modification to a homeowner without requiring new loan documentation or verification of the borrower’s income. Additionally, all seriously delinquent hybrid ARM borrowers regardless of when they became delinquent must be considered for some type of interest-rate modification. One type would reduce the initial interest rate for five years (to as low as 3.5 percent), after which the loan would be converted to an FRM at a low rate. Another type of modification would introduce a ten-year interest-only period and also reduce the (adjusting) interest rate over the life of the loan (to as low as 3.5 percent).

Subprime Option ARM borrowers must be considered for modifications that eliminate the negative amortization trigger, reduce LTV to as low as ninety-five, reduce the interest rate (to as low as 2.5 percent) and prevent future adjustments

from exceeding a lifetime interest rate cap of seven percent, and possibly introduce a ten-year interest-only period.

Finally, *subprime FRM* borrowers must be considered for interest-rate reductions similar to those offered to Option ARM borrowers: a borrower can receive either a permanent reduction in the interest rate or a ten-year interest-only period followed by a low rate for the remaining life of the mortgage.

Countrywide agreed to proactively contact borrowers eligible for all of the foregoing modifications. Although it agreed to this on October 6, 2008, it announced that it would not be ready to contact borrowers until December 1, 2008.²⁵ Countrywide also agreed to reach out to Hybrid and Option ARM borrowers whose mortgage payments were scheduled to change.²⁶ These borrowers would be encouraged to contact Countrywide if they expected to have trouble making the new payments. Finally, Countrywide agreed to suspend the foreclosure process for any borrower who might be eligible for a modification. The suspension should last as long as necessary to determine borrower eligibility.

2.2 Hypotheses

The Countrywide Settlement was widely reported in October 2008 and was rolled out nationwide beginning in December 2008. Figure 1 documents the sudden interest in the Settlement during this period: as reported by GoogleTrends,²⁷ internet

²⁵See, for example, this press release from the Attorney General for Washington State: <http://www.atg.wa.gov/countrywidePR100608.aspx> (“Countrywide said the loan modification program will be ready for implementation by December 1, 2008, and that the company would engage in proactive outreach to eligible customers at that point.”).

²⁶“Subprime or pay option ARM borrowers whose loans were originated on or before December 31, 2007, and whose payments are scheduled to change as a result of an interest-rate reset, recast, or expiration of an interest-only term shall be advised prior to the payment change to contact servicing personnel if they believe they will not be able to afford their new payments. In the event that borrowers respond to this solicitation, they shall be considered for loan modifications under the eligibility criteria in this agreement.” See Multi-State Settlement, page 7

²⁷<http://www.google.com/trends>

searches for the term “Countrywide Mortgage” spiked in October, as newspapers around the country announced the Settlement. Search activity increased steadily thereafter.

We view the settlement as a unique opportunity to assess homeowner response to sudden announcement of a typical modification policy (the announcement, in other words, was an exogenous shock, an assumption we justify in the next section). We use a differences-in-differences empirical approach: Relative to mortgages serviced by comparable servicers, were Countrywide mortgages more likely to move from current to sixty days delinquent during the period immediately after public announcement of the Settlement? By abruptly stopping payment, homeowners could make themselves eligible for the benefits of the Settlement.

We test for these effects beginning in October 2008, the month of Settlement announcement. There is, however, a potential confound beginning in early 2009. In February of that year the federal government announced plans to implement a widespread modification program, the Home Affordable Mortgage Plan (HAMP), which went on-line in March 2009.²⁸ This program may have affected homeowner behavior, across all servicers, possibly in much the same way as the Countrywide Settlement. To avoid confounding our inference by the effects of the HAMP program announcement, we focus our analysis on the behavior of borrowers during the first few months after Settlement announcement (October 2008 to February 2009).

Countrywide was aware of the potential for strategic behavior. Its Settlement included a provision stating that, if it “detects material levels of intentional nonperformance by borrowers that appears to be attributable to the introduction of the loan modification program, it reserves the right to require objective prequalification of borrowers for loan modifications under the program and to take

²⁸<http://www.bloomberg.com/apps/news?pid=20601103&sid=a39GJA5.gTMc&refer=us>

other reasonable steps.”²⁹ This provision was not widely reported and may not have deterred homeowners from strategically defaulting on their mortgages in order to qualify for modifications.

To be sure, an increase in the delinquency rate among Countrywide borrowers (relative to those in the Control Group) does not necessarily show that they were acting strategically to become eligible for modification. Borrowers who stopped paying may be precisely those whom the Settlement targets: homeowners who are struggling to pay and likely to default in the near future. To determine whether economic distress is driving excess post-Settlement defaults among Countrywide borrowers (relative to the Control Group), we examine the behavior of homeowners who were *least* likely to default when the Settlement was announced: those who had utilized a small fraction (less than thirty percent) of the available credit on their credit cards and those whose loans had relatively low current CLTV ratios. Because these homeowners had access to significant amounts of additional liquidity, or might have had some positive equity left in their houses, they were less likely to default in the absence of a modification program, at least in the near future. If we observe a rise in delinquency rates among these homeowners, we think it is suggestive of strategic behavior by those impacted by the Settlement, rather than changes in other economic factors that might be coincident with announcement of the Settlement.

Finally, we consider the behavior of borrowers with FRMs. While hybrid ARMs are a risky mortgage product usually targeted at subprime borrowers, FRMs are a more conventional mortgage product that is often taken out by prime borrowers who would not have qualified for modification under the Settlement. We might observe a response to Settlement announcement among subprime FRM borrowers, but we do not expect to observe one among non-subprime FRMs. This comparison of subprime versus non-subprime FRMs is particularly useful because it tests whether

²⁹Multi-State Settlement, page 9
(<http://www.ct.gov/ag/lib/ag/consumers/finalmultistatefcsettlementtermsheet.pdf>).

the Settlement announcement altered behavior only among the particular Countrywide loans that were eligible for relief.

3 Data and Methodology

3.1 Data

Our primary dataset links loan-level data from mortgage servicers (provided by BlackBox Logic) to credit report information from Equifax. BlackBox is a private company that provides a comprehensive, dynamic dataset of about twenty-one million privately securitized Subprime, Alt-A, and Prime loans originated after 1999. These total about ninety percent of all privately securitized mortgages from that period. The data include static information taken at the time of origination, such as mortgage date and amount, FICO credit score, servicer name, interest rate, term, and interest rate type. BlackBox also records certain dynamic data, such as the monthly payment, mortgage balance, and delinquency status.

Equifax is a credit reporting agency that provides monthly data on borrowers' current credit scores, payments and balances on mortgage and installment debt, and balances and credit utilization for revolving debt (such as credit cards and HELOCs). Equifax reports Vantage as the credit score. Intended to be comparable to FICO, the Vantage score was designed by the three credit reporting bureaus (Equifax, Experian, and TransUnion) to measure overall borrower credit health. Vantage scores range from 501 to 990.

Before linking the two datasets, we restricted the BlackBox data to the types of loans that might have been eligible for the Countrywide Settlement, namely first-lien mortgages on properties that were not purchased either as second homes or by investors. Additionally, we kept only loans that were originated between 2005 and

the first half of 2007 and that had an origination LTV greater than seventy. Finally, we excluded mortgages serviced by IndyMac, which was seized by the FDIC in 2008 and announced a major modification program prior to Countrywide’s settlement. These restrictions yielded the “BlackBox Sample.”

Credit information from Equifax was linked to the BlackBox Sample to create a “Matched Sample.” The linkage was performed by 1010Data, a provider of data warehousing and processing, using a proprietary match algorithm. To deal with the possibility of mismatched loans between BlackBox and Equifax, we require a close correspondence between loan balance between both BlackBox and Equifax databases. In addition, we restricted the matched sample to mortgages for which both BlackBox and Equifax report the same borrower Zip Code at the beginning of our analysis period (January 2008). The combination of both data sources provides a rich loan-level database that includes information about loan characteristics and credit histories.

Because the Equifax data record balances on other mortgages held by the borrower, we are able to compute a dynamic combined loan balance for each property. This is used to calculate a current CLTV using Zip-level Home Prices Indices provided by Zillow. To avoid the possibility of including liens from other properties when computing loan balances, we compute current CLTV only for borrowers with no more than one closed-end second lien.³⁰

In the analysis below, we will report results both for the full BlackBox Sample as well as the smaller Matched Sample. Variables provided by Equifax are used only in the Matched Sample.

3.2 Empirical Methodology

Our objective is to measure the effect of the Countrywide Settlement on borrower behavior immediately after it was announced in October 2008. One could

³⁰For both the BlackBox and Matched Samples, we used the MAPLE/Geocorr2k engine provided by the Missouri Census to link property Zip Code to Metropolitan Statistical Areas.

simply study mortgage delinquency rates among Countrywide loans before and after the Settlement announcement in order to deduce its effect on homeowner behavior. But this would ignore other environmental conditions affecting homeowner behavior. We address this inference problem using a differences-in-differences (DD) approach that compares Countrywide mortgages (treatment group) to comparable mortgages (control group) before and after the Settlement announcement.

Identifying an appropriate control group is the key challenge here. The DD approach uses the control group to account for environmental conditions that may affect delinquency rates at the time of the Settlement announcement, but are changing in the same way for both the treatment and control groups. Ideally, we would identify a group of borrowers whose mortgages were not originated or serviced by Countrywide, but who would otherwise display the same behavior as Countrywide borrowers in the absence of the Settlement.

For our analysis of a particular class of mortgages (2/28 ARMs, 3/27 ARMs, subprime FRMs, and non-subprime FRMs), we select as a Control Group the same class of loans serviced by institutions other than Countrywide (excluding IndyMac). During the period when loans in our sample were originated (2005-2007), the market for subprime lending was extremely competitive. Mortgage brokers typically accessed databases that listed mortgage terms for many wholesale lenders. Indeed, as we will show below, subprime Countrywide and Control Group loans exhibit small differences in observable attributes both at origination and at time the Settlement was announced. Additionally, there is little change in these observable attributes around the time of the announcement.

One might be concerned that, because Countrywide was sued while other mortgage lenders and servicers were not, Countrywide's loans are different from those of other lenders (an omitted variable bias), or that the lawsuit itself was triggered by mounting delinquencies among Countrywide loans (reverse causality). While

potentially troubling, we do not believe that these issues generate an appreciable bias in our results. State attorneys general appear to have selected Countrywide as a defendant because it was the largest originator and servicer of subprime mortgages and was still solvent at the time of the suits. Other originators, such as New Century and IndyMac, had already collapsed. Although Countrywide allegedly failed to disclose all features of its mortgage products, its lending practices might not have differed substantially from those of other institutions, who appear to have limited their disclosures to borrowers as well.³¹ Finally, as we show below, the homeowners who responded most strongly to the Settlement were borrowers with relatively high available liquidity (through credit cards) and low current CLTV. Not only were these borrowers the least likely to default in the absence of the Settlement, but there is little evidence of a pre-Settlement trend in the delinquency rates of these borrowers. These findings are inconsistent with the notion that post-Settlement increases in delinquency rates are merely a continuation of preexisting trends.

For these reasons, we view the Countrywide Settlement as a plausibly exogenous shock to Countrywide mortgages, which are closely similar to mortgages serviced by other institutions. Finally, it is important to stress that our analysis below includes both detailed controls for time-varying mortgage terms as well as Countrywide-specific fixed effects interacted with time dummies, both before and after the Settlement announcement.³² Even if similar borrowers were offered different terms by Countrywide than by other other services, our controls should capture this heterogeneity.

In sum, our identification assumption is that, in the absence of the Settlement, comparable Countrywide and Control Group loans would display similar payment

³¹See, e.g., Lacko and Pappalardo (2007). Moreover, it is not clear to what extent differences in disclosure of mortgage terms could affect borrowers' choices. Bucks and Pence (2008) report, based on Survey of Consumer Finances, that although most borrowers seem to know basic mortgage terms, borrowers with adjustable-rate mortgages appear likely to underestimate or to not know how much their interest rates could change.

³²In unreported regressions, we also included fixed effects for the top five servicers, fully interacted with pre- and post-Settlement time dummies.

patterns (up to a constant difference) during the period of study.

Tables 3 to 6 help justify our identifying assumption that Countrywide and Control Group servicers had a similar borrower base with comparable loan terms. The tables offer summary statistics for the stock of mortgages that had not yet become sixty days delinquent by September 2008, just before public announcement of the Settlement on October 6, 2008. The summary statistics describe the characteristics of the loans both at origination and as of September 2008. Measured at means, Countrywide and Control Group loans had similar CLTVs, interest rates, and credit scores. Origination FICO, for example, differs between the two groups by about two points among 2/28 ARMs and subprime FRMs. The difference is somewhat larger among 3/27s and non-subprime FRMs. Origination balances as well as post-origination credit scores (“Current Vantage”), interest rates (“Current Interest Rate”), and credit card utilization (“Utilization”) are closely similar for both groups, particularly among 2/28 ARMs.

Figures 2 through 4 explore our identifying assumption further. They track the evolution of interest rates, Vantage Scores, and CLTV among 2/28 ARMs by quarter of origination. Figure 2 plots current interest rates and shows that Countrywide and Control Group loans generally track each other during the months preceding the Settlement announcement. We do see a difference in interest rates during the quarter following the reset date: Countrywide loans tend to reset to a higher average interest rate than Control Group loans. This suggests that Countrywide loans may have been riskier than those in the Control Group. We control for this difference by, for example, controlling for variation in interest rates over time in the regressions reported below.

Figures 3 and 4 show that Vantage scores and CLTV evolved in nearly identical patterns for Countrywide and Control Group loans. The current Vantage Score was virtually identical across the two groups during the months preceding the

Settlement announcement: the difference never exceeds ten Vantage Score points (less than twelve percent of a standard deviation) in any origination quarter. Similarly, CLTV is very similar across Countrywide and Control Group loans in all origination vintages except Fourth Quarter of 2005, and even in that vintage the difference is consistently about five percentage points over time.

We observe similar patterns among 3/27 ARMs and FRMs. Overall, these patterns point to close comparability across Countrywide and Control Group loans before the Settlement was announced in October 2008. Because variation between the two groups could be due to differences in the timing and mix of mortgages originated, we include a wide range of controls (for loan, loan pool, and individual borrower characteristics) in the regressions reported below.

3.3 Empirical Specification

We estimate a probit specification of the following form:

$$\Pr(Y_{it} = 1 | Current_{t-60}) = \alpha + \beta \cdot CW_{it} + \mu \cdot Oct - Dec + \delta \cdot CW_{it} \cdot Oct - Dec + \gamma \cdot X_{it} + \epsilon_{it}$$

The dependent variable is the probability that a mortgage becomes sixty days past due in month t ($Y_{it} = 1$), conditional upon being current sixty days earlier ($Current_{t-60}$). We call this the “rollover rate” from current to sixty days delinquent. CW_{it} is a dummy variable that takes the value 1 if the loan is serviced by Countrywide. $Oct-Dec$ is another dummy, taking the value 1 if month t occurs during the period October through December 2008. October 2008 is the first month during which we would observe a borrower response to announcement of the Settlement on October 6, 2008.³³ Because the federal government announced HAMP

³³Our data records the payment status of the borrower as of the end of a given month. For example, a borrower who is thirty-days delinquent in September will be recorded as being sixty-days delinquent in October if no new payments were received by the end of October. Thus, a delinquency status in October 2008 is the first record that could reflect a borrower’s decisions made after the Settlement announcement.

in March 2009—a potential confound—we view February 2009 as the last month of the “program period.” X_{it} is a vector of loan and borrower characteristics that includes variables such as initial and current Vantage score, initial and current CLTV, origination quarter, initial interest rate and loan balance, the magnitude of any interest rate reset, dummies for each quarter before and after the Settlement announcement, and interactions between these time dummies and the Countrywide indicator (CW_{it}).

The coefficient of interest is δ , which measures the change in the “relative rollover rate” (i.e., the difference between Countrywide and Control Group) during the months immediately after the Settlement announcement (October-December 2008), relative to months just before the announcement (July - September 2008). Standard errors are clustered by mortgage (we obtain comparable results with standard errors clustered by mortgage servicer). The estimation period runs from January 2008 to February 2009.

We also estimate equation (1) separately for subsamples of loans with the same origination quarter. This allows us to control more carefully for heterogeneity across loans due to vintage-specific effects, such as the date of an interest rate reset.

4 Program Announcement and Strategic Behavior

4.1 Strategic Default in Hybrid ARMs

We observe a marked increase in delinquency rates among Countrywide loans, relative to the Control Group, immediately after the Settlement announcement. Figure 5 plots the probability that non-delinquent (“current”) 2/28 ARMs become thirty days past due for the first time. The top panel examines all loans. Although there is a small difference between Countrywide and Control Group loans during the

three months preceding the Settlement Announcement, the difference widens substantially in October 2008, the first month in which we could observe an effect of the Announcement. The bottom panel of Figure 5 subsets on borrowers who had sufficiently large liquidity available to them through credit cards that they could charge the equivalent of five or more months of mortgage payments. We view these borrowers as relatively less likely to default in response to economic shocks. Among these “high utilization” borrowers, we see an even stronger response to the Settlement Announcement: In October 2008, the probability of rolling from current to thirty days past due spikes among Countrywide loans, but remains flat in the Control Group.

Figure 6 examines the probability that loans transition from current to sixty days past due for the first time. We are particularly interested in this rollover rate because the Countrywide Settlement targeted borrowers who made this transition. In these panels, the effect of the Settlement could be first observed in October 2008. In that month, we could see a response among borrowers who had just become thirty days past due in September; they could decide, in response to the program, to miss another monthly payment. However, we expect a more pronounced effect in November 2008, because that is the first month in which we could see borrowers transition from current to sixty days past due in response to the Settlement. Among 2/28 and 3/27 ARMs (the top four panels), we see Countrywide rollover rates increase relative to the Control Group in the months preceding October 2008, and then increase substantially in November and December. There is, then, an evident pre-Settlement increase in Countrywide delinquency rates. However, when we subset on “high utilization” borrowers this trend moderates substantially (and is statistically insignificant in regressions reported below). Instead, we see a post-Settlement spike in the transition from current to sixty days past due among Countrywide loans, while the rollover rate among Control Group loans rises at only a moderate rate both before and after the Settlement.

These patterns point to a substantial increase in rollover rates among Countrywide borrowers immediately after the Settlement announcement. To investigate these patterns formally, Table 7 implements our specification in equation (1) for hybrid 2/28 ARMs. Column (1) estimates the model using the full BlackBox Sample, but includes only a minimal set of controls: quarterly time dummies, a Countrywide dummy, and interactions between the Countrywide and time dummies. The time dummies identify the quarters before and after Settlement Announcement. The excluded category is July 2008 to September 2008, the quarter immediately preceding Announcement. We interact each of these time dummies with the Countrywide dummy. Together, these time and Countrywide \times time dummies control for time-varying differences between Countrywide and Control Group loans.

Column (2) adds the Blackbox Controls, listed in Table 3. These controls include a wide range of loan- and borrower-level characteristics, such as origination FICO, initial CLTV, current LTV, initial interest rate and any change in rate over time. Column (2) also includes MSA fixed effects, dummies that identify loans that had reset within the preceding three or six months, and interactions between these reset variables and the Countrywide dummy (see Table 13 in the Appendix for the full set of coefficients). These variables account for heterogeneity across loans and systematic differences between Countrywide and the Control Group, including the possibility that Countrywide mortgages experience higher default rates at rate resets or during other time periods. Together, the variables allow us to test whether post-Settlement differences between Countrywide and the Control Group are significantly different from pre-Settlement differences.

Columns (3) and (4) analyze the Matched Sample: Column (3) includes the same controls as in Column (2); Column (4) includes the full set of Equifax controls, including information about second liens, credit card utilization, and current credit scores (Vantage). Column (4) also uses current and origination CLTV, whereas prior columns use current and origination LTV.

Finally, Column (5) changes the dependent variable: it equals 1 only when a homeowner (i) rolls from current to sixty days past due for the first time and (ii) remains current on credit card balances while rolling sixty days past due and during the next six months. Homeowners who satisfy conditions (i) and (ii) are thought by some observers to be “strategic defaulters.”³⁴

The key covariate is the Countrywide \times Oct-Dec interaction, which tests whether the difference in rollover rates between Countrywide and the Control Group is greater immediately after the Settlement announcement than immediately before (the omitted category is July to September 2008). The coefficients in these tables are marginal effects and can be compared to the mean monthly rollover rate among Countrywide loans during July to September 2008 period, as reported at the bottom of the table (“Avg. Delinquency”).³⁵

Across all columns in Table 7, the Countrywide \times Oct-Dec interaction is positive, highly significant, and large relative to the rollover rate among Countrywide loans immediately before the Settlement announcement. We find this effect in both the BlackBox and Matched Samples. Column (4) reports that the rollover rate increased by 0.0063, a thirteen percent increase relative to the mean rollover rate of 4.8 percent. Moreover, the Countrywide \times Oct-Dec coefficients in column (1) to (4) are similar in magnitude, suggesting that restricting our attention to the BlackBox-Equifax Matched Sample does not bias our inference.³⁶

While strongly statistically significant and economically sizable (in relative terms), these effects are derived from a model that implicitly constrains the effect of

³⁴See Experian-Oliver Wyman Market Intelligence Reports (2009-2010).

³⁵Following Kremer & Snyder (2010) and Puhani (2008), we do not make the adjustments recommended by Ai & Norton (2003) because our interaction measures a difference-in-difference treatment effect.

³⁶We obtained qualitatively similar results in unreported regressions that augment the specification in Column (4) to include fixed effects for the top five non-Countrywide mortgage servicers (other, smaller servicers comprised the omitted category). These servicer fixed effects were interacted with each of the quarterly time dummies. The Countrywide \times Oct-Dec interaction remained positive, highly significant, and economically large. It was also greater than and statistically different from each “Servicer” \times Oct-Dec interaction for the non-Countrywide servicers.

the Settlement announcement to be the same for all loan vintages. The Settlement, however, could have impacted some loan vintages more than others. By its terms, it targeted loans that reset around or after the Settlement announcement. We therefore separately examined loans by vintage to determine whether the effect is larger for some vintages than others. In particular, we reran the specification in Column (4) for each quarterly origination cohort (see Table 14 in the Appendix). Our regressions show that the relative increase in delinquency for Countrywide loans is present in a number of origination cohorts. The fact that we find these results among cohorts that were not resetting around the Settlement Announcement alleviates the concern that these results are driven by unobservable differences between Countrywide and the Control Groups around the reset date (not also that our regressions control for the magnitude of any interest rate reset).

These estimates suggest that the Countrywide Settlement increased the incentive of borrowers to become delinquent in order to benefit from the Settlement. On the other hand, Table 7 does reveal a pre-Settlement increase in rollover rates among Countrywide loans, which could confound our estimates. To explore this possibility, and to consider alternative proxies for borrowers who might have been able to make their payments but chose not to, we stratified our sample by levels of credit card utilization (utilization is measured monthly). In particular, we separated borrowers into three groups: borrowers with access to credit equal to five months of mortgage payments (“5+ Months”), those with available credit equal to two to four months of payments (“2-4 Months”), and those with available credit equal to no more than one payment (“0-1 Months”). Borrowers with higher levels of available credit (e.g., “5+ Months”) are likely to be less liquidity constrained and therefore less vulnerable to economic shocks than borrowers with lower levels of available credit.

Columns (1) through (3) of Table 8 show that the effect of the Settlement is strongest among borrowers with the most available credit. The relative increase in

delinquency is greater than twenty percent among borrowers in the “5+ Months” category, but only about twelve percent among borrowers in the “0-1 Months” category. Equally important, there is no evidence of a pre-Settlement increase in rollover rates among borrowers in the former category, while there is potential evidence of a trend among other borrowers. Together, these results are inconsistent with the possibility that idiosyncratic economic shocks to Countrywide borrowers explain the differences between Countrywide and the Control Group immediately after the Settlement announcement. Our results—especially the absence of a pre-Settlement increase in rollover rates among borrowers with higher available credit—also support the hypothesis that the Settlement induced defaults among borrowers who were unlikely to default otherwise, at least in the near future.

We obtain further evidence on potential strategic behavior by splitting the sample by current CLTV levels, as in Columns (4) through (6) of Table 8. Interestingly, borrowers in the lowest CLTV bucket (below 100) show a sizeable increase in delinquency relative to the Control Group just after the Settlement Announcement (a 14.5 percent relative increase). There is only weak evidence of pre-Settlement increase in rollover rates among these borrowers. These results offer further support for the hypothesis that the Settlement induced defaults among borrowers who were unlikely to default otherwise, at least in the near future.

Tables 9-10 repeat the analysis for hybrid 3/27 ARMs and report roughly comparable results. Across all columns in Table 9, we observe a substantial and statistically significant increase in Countrywide’s rollover rate relative to the Control Group immediately after Settlement announcement. In the Matched Sample with a full range of loan-level controls—Column (4)—we observe a 12.5 percent increase relative to the pre-Announcement rollover rate among Countrywide loans (3.6 percent). The evidence of a pre-Settlement increase in rollover rates is weaker here

than in the sample of 2/28 ARMs.³⁷ When we estimate the rollover rate among borrowers who remained current on credit card accounts for at least six months after becoming delinquent—Column (5)—we observe an effect greater than fourteen percent of the pre-Announcement rollover rate (1.2 percent). In this specification, there is no evidence of pre-Settlement increase in rollover rates.

Table 10 splits the 3/27 ARM sample by credit card utilization and current CLTV. We observe sizeable effects across all levels of credit card utilization, though the effect is strongest (around 15.5 percent relative to the pre-Settlement delinquency rate) among borrowers with the lowest available utilization (“0-1 Months”). The effect is smaller (around 7 percent) and only marginally significant among borrowers the greatest available utilization (“5+ Months”). When we stratify by current CLTV, we find the largest effects among borrowers with the lowest CLTV ratios: the increase in the relative rollover rate is nine percent and thirty percent, respectively, among above-water ($CLTV < 100$) and slightly underwater ($100 \leq CLTV < 120$) homeowners, but 2.7 percent among deeply underwater homeowners ($120 \leq CLTV$). Interestingly, there is no evidence of a pre-Settlement increase in rollover rates among the borrowers ($100 \leq CLTV < 120$) with the largest post-Settlement response. These results, like those for 2/28 ARMs, suggest the Countrywide Settlement may have induced strategic defaults among borrowers—with high available liquidity and low current CLTVs—who were the least likely to default otherwise.

4.2 Strategic Defaults in FRMs

To alleviate concerns about our identification strategy, we look at the behavior borrowers with fixed-rate mortgages (FRMs). We note that the Settlement offered relief to subprime FRM borrowers, but a substantial fraction of securitized FRMs in

³⁷We obtain qualitatively similar results in unreported regressions that augment Column (4) to include fully-interacted servicer fixed effects along the lines described in footnote 35 above.

our data are non-subprime loans offered to borrowers who had good credit. Non-subprime FRMs therefore provide a useful control group: although the Settlement could affect behavior among subprime FRM borrowers, we do not expect to observe a post-Settlement change in the behavior of non-subprime FRM borrowers (relative to those with FRMs serviced by Control Group institutions).

Subprime status is difficult to define, as there is no single agreed-upon definition. In order to be conservative, we define an FRM as “subprime” if origination FICO was less than 620, a common threshold for subprime status.³⁸ While some borrowers with an above-620 FICO might also be considered subprime (because, for example, they made low down payments), mortgages with a FICO below 620 are highly likely to be viewed as subprime and thus qualify for modification under the Settlement if they were also delinquent.

Our hypothesis finds support in the bottom panels of Figure 6, which plot the transition from current to sixty days past due (for the first time) among subprime and non-subprime FRMs. Among subprime FRMs, we see a roughly constant difference between Countrywide and Control Group delinquencies until November and December 2008. During those months, Control group delinquencies decline slightly, but Countrywide delinquencies rise. In contrast, there is no discernible pattern among Prime FRMs during this period. Delinquency rates of Countrywide loans remain slightly above those of Control Group loans both before and after the Settlement Announcement.

Tables 11 and 12 implement the probit specification in equation (1) for subprime and non-subprime FRMs, respectively. Column (4) of Table 11 shows that the rollover rate among subprime Countrywide borrowers increased substantially,

³⁸Most lenders define a borrower as subprime if the borrower’s FICO credit score is below 620 on a scale that ranges from 300 to 850. See also Keys *et al.* (2010).

relative to the Control Group, immediately after the Settlement announcement.³⁹ The effect amounts to a thirty percent increase over the pre-Settlement delinquency rate among Countrywide subprime FRMs (1.5 percent).⁴⁰ Among non-subprime FRMs, Table 12 shows no increase in Countrywide delinquencies relative to the Control Group (the coefficient is negative and economically small). Overall, these results parallel those we obtain for 2/28 ARMs: announcement of the Settlement induced a substantial increase in relative rollover rates and strategic defaults among Countrywide mortgages that were eligible for relief, but not among non-Countrywide mortgages and not among Countrywide mortgages that were ineligible for relief.

5 Conclusion

The results in this paper provide evidence of strategic behavior by borrowers who were willing to suspend mortgage payments in order to qualify for a newly announced mortgage modification. In the months immediately following the announcement of the Countrywide Settlement, the number of Countrywide 2/28 ARMs borrowers rolling from current to sixty days delinquent rose by more than thirteen percent relative to comparable servicers whose mortgages were not covered by the legal settlement.

The estimated effects are strong among those who appear least likely to have defaulted otherwise: borrowers who had the most available credit and those with the lowest current CLTVs. These groups experienced a substantial rise in both rollover

³⁹In unreported regressions, we split both FRM samples by credit card utilization and current CLTV. Among subprime FRMs, we found strong effects among borrowers with high available utilization and low CLTV, though the effect for low CLTV borrowers was marginally significant. Among non-subprime FRMs, the effect of the Settlement was negative and often insignificant across all utilization and CLTV buckets.

⁴⁰We obtain similar but only marginally significant results in models similar to Column (4) that include fully-interacted servicer fixed effects along the lines described in footnote 35. When we split the sample by credit card utilization and current CLTV, the effects for high utilization and low CLTV borrowers are positive and sizeable, but insignificant, due in part to relatively small sample sizes.

rates, relative to comparable loans in the Control Group, immediately after the Settlement announcement. We confirm that these results are not due to idiosyncratic features of Countrywide ARMs by finding comparable effects among low-FICO FRMs (eligible for relief under the Settlement), but not among high-FICO FRMs (ineligible).

These results highlight the challenges associated with modifying mortgages in the presence of strategic behavior. Lenders can observe some of the same proxies for strategic behavior that we use in this paper, such as credit utilization and current credit scores. But other variables, such as the current cumulative loan-to-value (CLTV) ratio, may not be observable at the time of the modification decision.⁴¹ Recognizing this problem, mortgage modification programs often require costly reporting by borrowers, as well as trial periods, before permanent modification takes place. If borrowers behave strategically, as our results seem to suggest, these expensive and time-consuming verification procedures have a rational basis. But while verification procedures deter strategic default, they also delay foreclosure relief during a housing crisis. Our results do not shed light on this trade-off.

Our results may also explain why the federal HAMP program has had great difficulty in qualifying large numbers of borrowers for permanent mortgage modifications.⁴² Initial qualification requires only verbal information, while permanent modifications are time consuming and costly. In the presence of strategic behavior, it is important to find a tool that allows truly needy borrowers to separate themselves from other borrowers. Such a tool is not immediately apparent.

⁴¹While lenders can obtain current mortgage balances, house price indexes used to compute current CLTV are reported with a two-month lag after the sales took place.

⁴²There are other reasons that could hamper cost-effective renegotiation of mortgages. For example, Piskorski et al (2010) show that bank-held delinquent loans were foreclosed at a much lower rate relative to comparable mortgages that were securitized, suggesting that securitization and the associated institutional frictions may have adversely affected renegotiation of loans.

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Figure 1: Index of Web Searches for the Term “Countrywide Modification,” as Reported by Google Trends

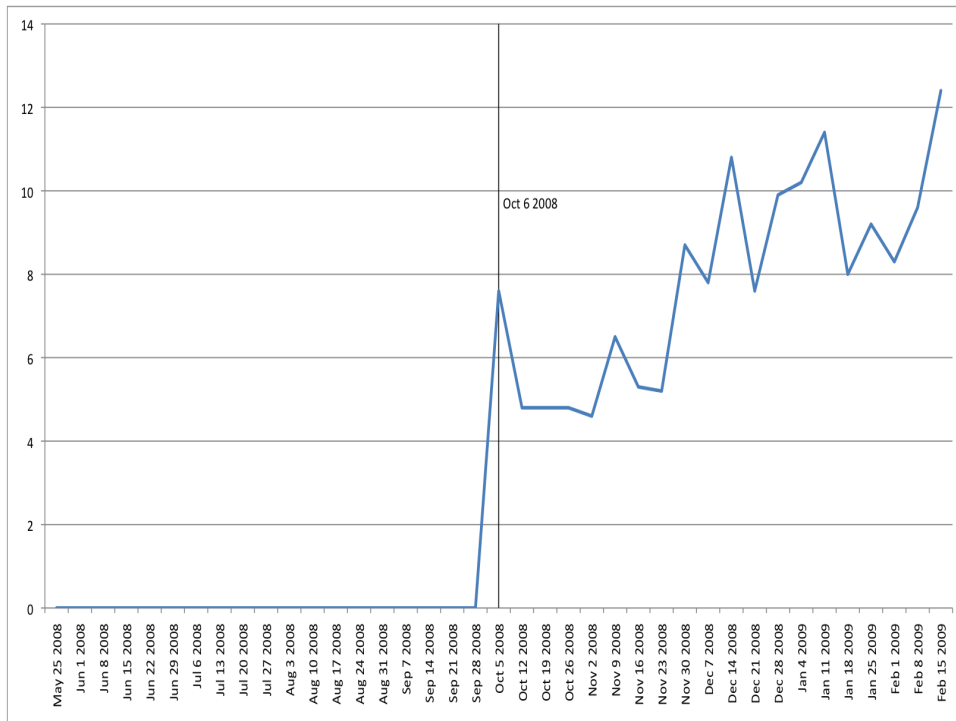


Figure 2: 2/28 ARMs: Current Interest Rate by Origination Quarter

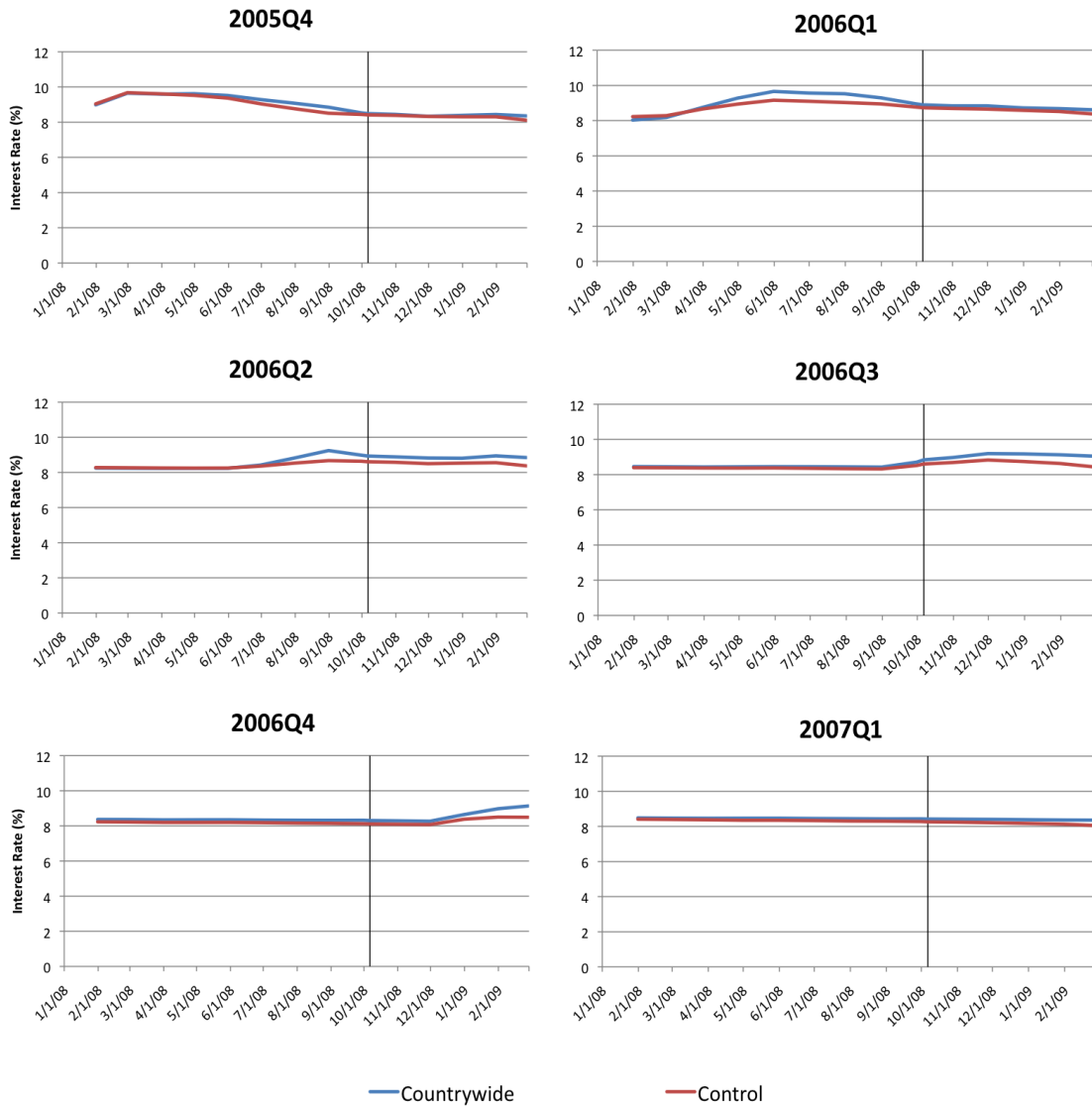


Figure 3: 2/28 ARMs: Current Vantage Score by Origination Quarter

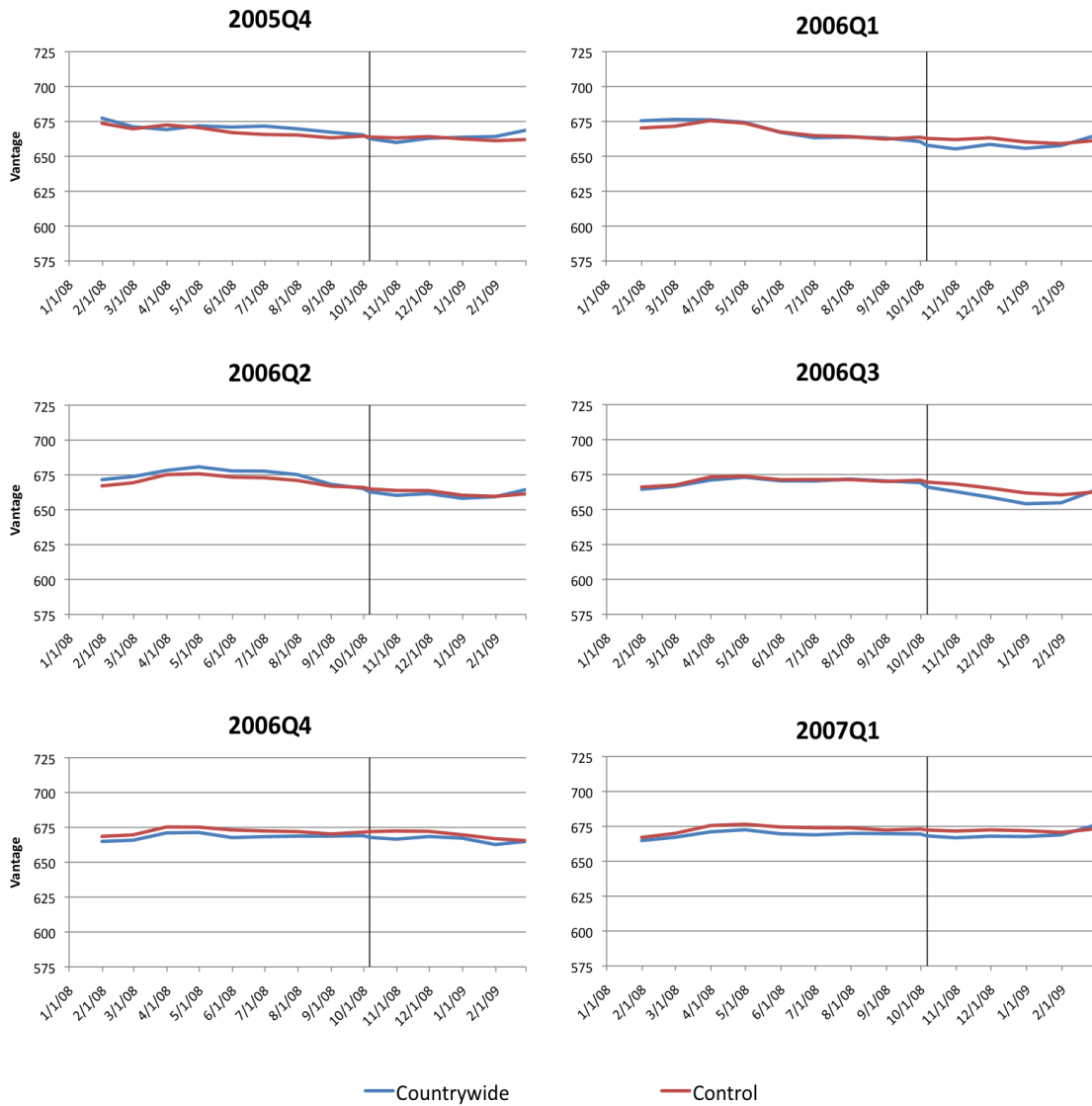


Figure 4: 2/28 ARMs: Current CLTV by Origination Quarter

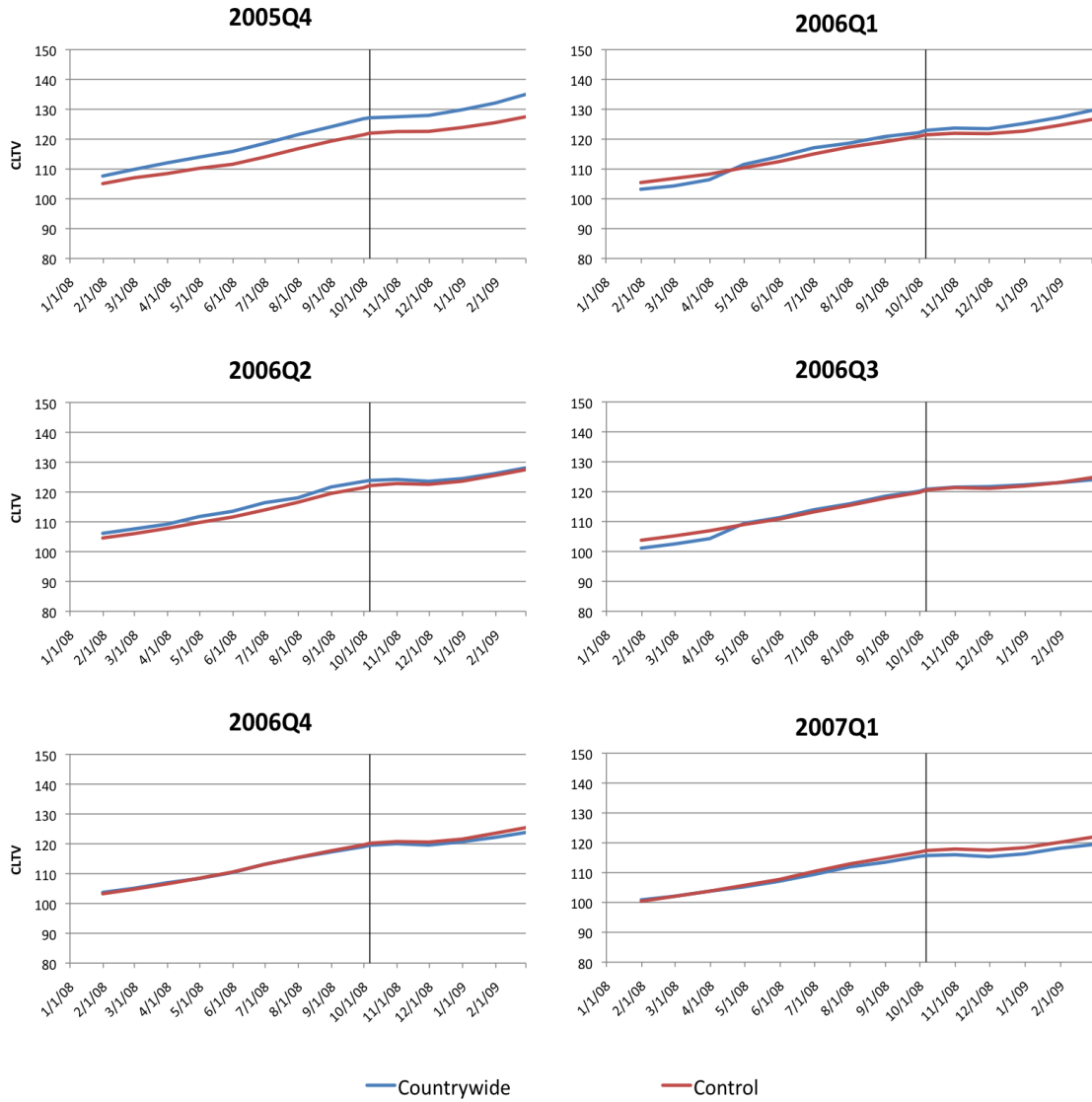


Figure 5: 2/28 ARMs: Probability of Rolling from Current to 30 Days Past Due

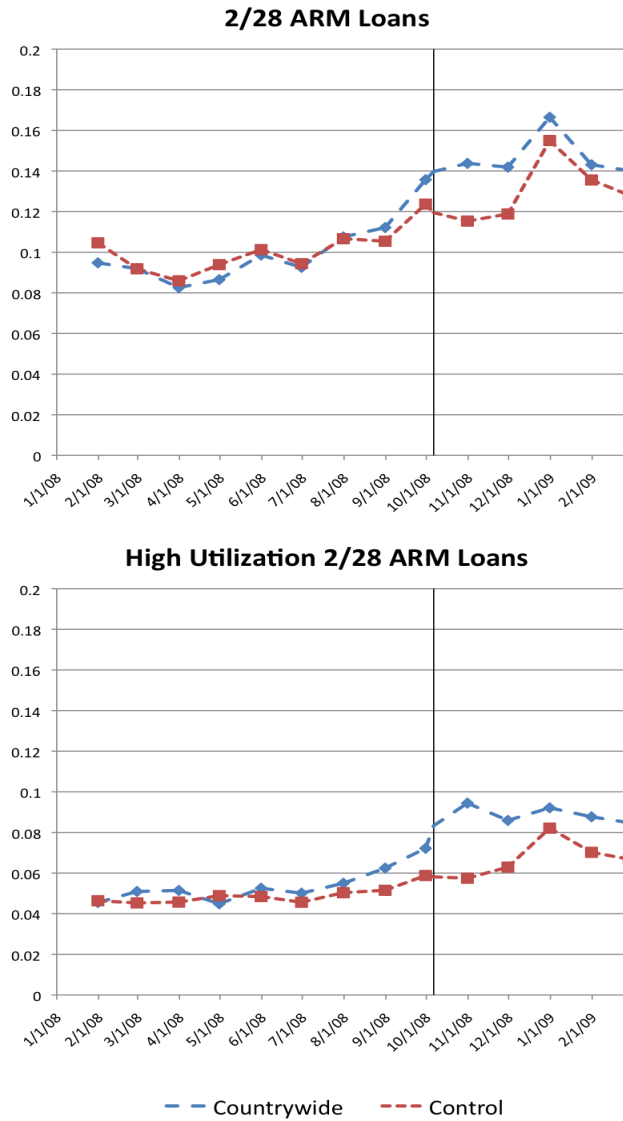


Figure 6: Probability of Rolling from Current to 60 Days Past Due

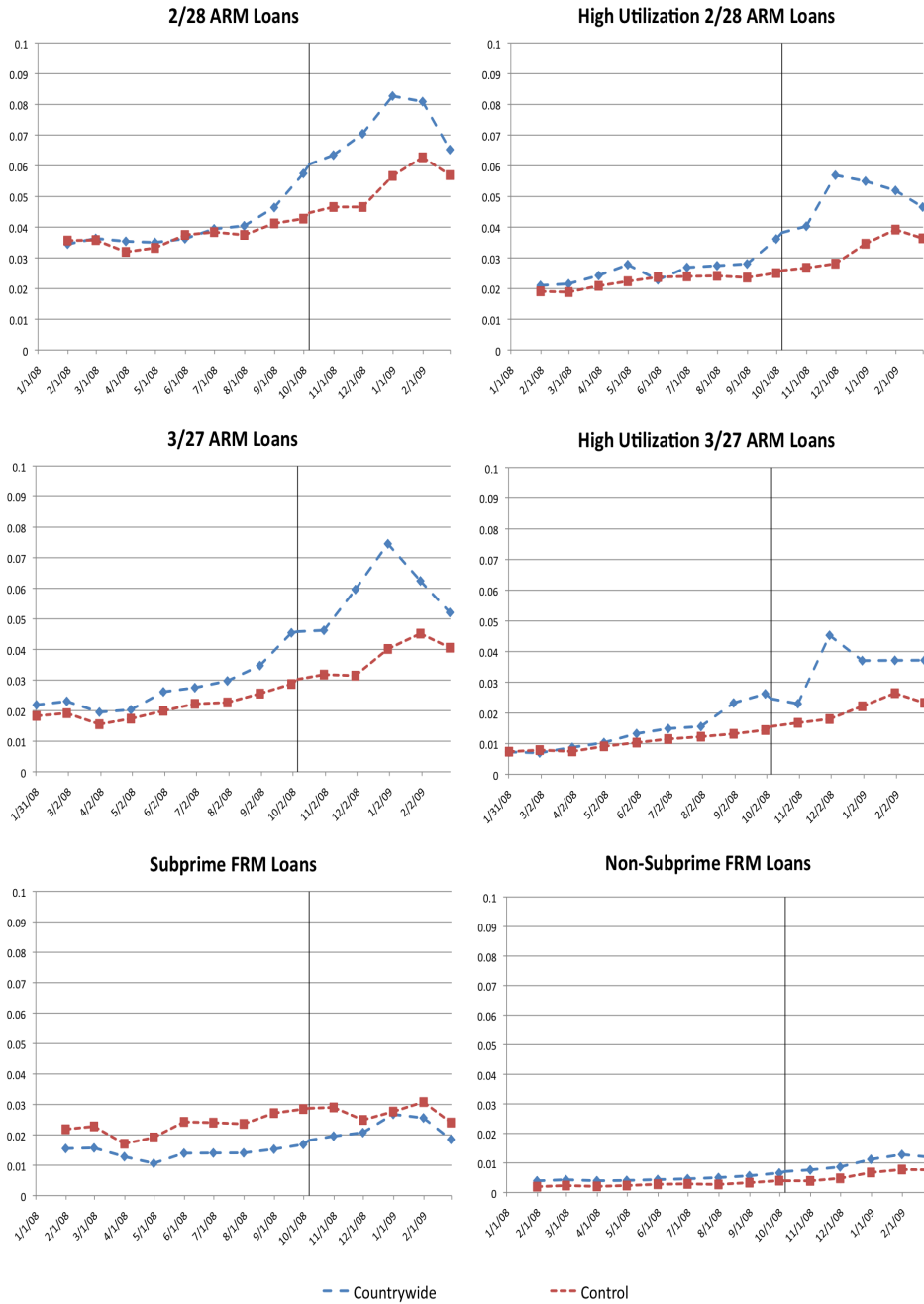


Table 1: Summary of Countrywide Settlement: Borrower Eligibility

Mortgage Type	Subprime Hybrid ARM, Option ARM, Subprime FRM
Origination Date	Before 2008
LTV	At least 75
Delinquency	Currently 60 or more days past due or likely to become 60 dpd after rate reset or negative amortization trigger
Income	Post-modification payments (including tax/insurance escrow) do not exceed 42 percent of income

Table 2: Summary of Countrywide Settlement: Modification Options for Subprime Loans

	Hybrid ARMs	Option ARMs	FRMs (and other)
Option 1: Unsolicited extension of introductory interest rate period for 5 years	Yes		
Option 2: Extension of introductory rate for 5 years; conversion to FRM at low rate	Yes		
Option 3: 10-year interest-only period, followed by reduced interest rate for life of loan	Yes		Yes
Option 4: Reduced interest rate for life of loan			Yes
Option 5: Eliminate negative amortization, reduce principal to as low as 95 LTV, and either Option 3 or 4		Yes	

Table 3: Summary Statistics for 2/28 ARMs

	Countrywide			Rest			Total		
	mean	sd	count	mean	sd	count	mean	sd	count
0-1 Months of Utilization	0.57	0.49	43,418	0.52	0.50	216,558	0.53	0.50	259,976
2-4 Months of Util	0.16	0.36	43,418	0.14	0.35	216,558	0.14	0.35	259,976
5+ Months of Util	0.20	0.40	43,418	0.19	0.39	216,558	0.19	0.39	259,976
CLTV < 100	0.16	0.37	43,418	0.19	0.39	216,558	0.19	0.39	259,976
100 ≤ CLTV < 120	0.27	0.44	43,418	0.25	0.44	216,558	0.26	0.44	259,976
120 ≤ CLTV	0.32	0.47	43,418	0.31	0.46	216,558	0.31	0.46	259,976
<i>BlackBox Controls</i>									
- Initial CTLV	92.0	8.76	40,081	89.9	8.86	94,865	90.5	8.88	134,946
- Current LTV	110.2	23.4	33,195	110.2	23.9	166,117	110.2	23.8	199,312
- Initial Interest Rate	8.18	1.28	43,418	8.07	1.23	216,558	8.09	1.24	259,976
- Current Interest Rate	8.63	1.35	43,418	8.52	1.40	216,554	8.54	1.39	259,972
- Origination FICO	618.0	54.0	40,351	616.9	56.3	128,552	617.2	55.8	168,903
- Origination Balance	196,287	114,402	43,418	206,934	132,994	216,558	205,156	130,134	259,976
- Low/No Doc	0.42	0.49	43,418	0.60	0.49	216,558	0.57	0.49	259,976
- Doc Missing	0.078	0.27	43,418	0.36	0.48	216,558	0.32	0.47	259,976
- Refi	0.055	0.23	43,418	0.10	0.30	216,558	0.095	0.29	259,976
- Cash Out Refi	0.39	0.49	43,418	0.37	0.48	216,558	0.37	0.48	259,976
- Purchase Missing	0.0042	0.065	43,418	0.052	0.22	216,558	0.044	0.21	259,976
- Interest Only	0.28	0.45	43,418	0.11	0.32	216,558	0.14	0.35	259,976
- Interest Only Missing	0.0043	0.065	43,418	0.028	0.16	216,558	0.024	0.15	259,976
- Mortgage Insured	0.066	0.25	43,418	0.018	0.13	216,558	0.026	0.16	259,976
- Prepay Penalty	0.79	0.41	43,418	0.65	0.48	216,558	0.67	0.47	259,976
- Prior 60 DPD	0.15	0.36	43,418	0.14	0.35	216,558	0.14	0.35	259,976
- 60 DPD in Prior Year	0.12	0.33	43,418	0.11	0.31	216,558	0.11	0.32	259,976
<i>Equifax Controls</i>									
- Current CLTV	120.7	27.9	32,657	119.1	27.9	162,600	119.4	27.9	195,257
- CLTV Missing	0.25	0.43	43,418	0.25	0.43	216,558	0.25	0.43	259,976
- Initial Vantage	663.3	65.0	43,418	675.7	72.6	216,558	673.6	71.6	259,976
- Current Vantage	666.8	82.4	43,258	666.3	84.7	215,828	666.4	84.3	259,086
- 2 nd Lien Balance	47,922	31,419	19,044	52,550	38,337	81,634	51,674	37,172	100,678
- CES+	0.44	0.50	43,418	0.38	0.49	216,558	0.39	0.49	259,976
- Low Util HELOC	0.014	0.12	43,418	0.017	0.13	216,558	0.016	0.13	259,976
- Utilization	0.47	0.37	43,213	0.47	0.37	215,472	0.47	0.37	258,685
- Months of Credit	2.99	4.39	39,907	3.08	4.50	187,260	3.06	4.48	227,s167

Sample statistics are measured as of September 2008 among loans in the matched sample that were current two months prior

Table 4: Summary Statistics for 3/27 ARMs

	Countrywide			Rest			Total		
	mean	sd	count	mean	sd	count	mean	sd	count
0-1 Months of Utilization	0.49	0.50	20,339	0.41	0.49	73,117	0.42	0.49	93,456
2-4 Months of Util	0.15	0.36	20,339	0.16	0.36	73,117	0.16	0.36	93,456
5+ Months of Util	0.29	0.45	20,339	0.34	0.48	73,117	0.33	0.47	93,456
CLTV < 100	0.20	0.40	20,339	0.23	0.42	73,117	0.22	0.41	93,456
100 ≤ CLTV < 120	0.27	0.44	20,339	0.29	0.45	73,117	0.28	0.45	93,456
120 ≤ CLTV	0.28	0.45	20,339	0.29	0.45	73,117	0.29	0.45	93,456
<i>BlackBox Controls</i>									
- Initial CLTV	90.0	9.18	19,656	89.7	9.05	31,739	89.9	9.10	51,395
- Current LTV	106.6	23.2	15,608	107.7	22.2	59,727	107.5	22.4	75,335
- Initial Interest Rate	7.45	1.19	20,339	7.46	1.31	73,117	7.45	1.28	93,456
- Current Interest Rate	7.81	1.33	20,339	7.56	1.37	73,116	7.62	1.36	93,455
- Origination FICO	624.8	59.2	18,215	654.4	65.7	44,133	645.7	65.3	62,348
- Origination Balance	195,070	118,967	20,339	229,484	143,806	73,117	221,994	139,503	93,456
- Low/No Doc	0.37	0.48	20,339	0.65	0.48	73,117	0.59	0.49	93,456
- Doc Missing	0.028	0.16	20,339	0.36	0.48	73,117	0.29	0.45	93,456
- Refi	0.066	0.25	20,339	0.14	0.35	73,117	0.13	0.33	93,456
- Cash Out Refi	0.40	0.49	20,339	0.38	0.49	73,117	0.39	0.49	93,456
- Purchase Missing	0.0021	0.045	20,339	0.038	0.19	73,117	0.030	0.17	93,456
- Interest Only	0.35	0.48	20,339	0.23	0.42	73,117	0.26	0.44	93,456
- Interest Only Missing	0.0098	0.098	20,339	0.033	0.18	73,117	0.028	0.16	93,456
- Mortgage Insured	0.0090	0.095	20,339	0.019	0.14	73,117	0.017	0.13	93,456
- Prepay Penalty	0.71	0.45	20,339	0.48	0.50	73,117	0.53	0.50	93,456
- Prior 60 DPD	0.17	0.37	20,339	0.076	0.26	73,117	0.096	0.29	93,456
- 60 DPD in Prior Year	0.099	0.30	20,339	0.057	0.23	73,117	0.066	0.25	93,456
<i>Equifax Controls</i>									
- Current CLTV	116.7	26.9	15,321	115.6	25.8	58,457	115.8	26.1	73,778
- CLTV Missing	0.25	0.43	20,339	0.20	0.40	73,117	0.21	0.41	93,456
- Initial Vantage	676.9	73.4	20,339	705.7	85.5	73,116	699.4	83.9	93,455
- Current Vantage	680.7	91.4	20,276	700.5	100.3	72,905	696.2	98.8	93,181
- 2 nd Lien Balance	50,495	37,775	9,947	63,282	48,519	31,812	60,236	46,507	41,759
- CES+	0.47	0.50	20,339	0.41	0.49	73,117	0.42	0.49	93,456
- Low Util HELOC	0.035	0.18	20,339	0.052	0.22	73,117	0.049	0.21	93,456
- Utilization	0.45	0.37	20,230	0.45	0.35	72,552	0.45	0.36	92,782
- Months of Credit	4.53	6.14	18,681	5.66	6.78	66,335	5.41	6.66	8,5016

Sample statistics are measured as of September 2008 among loans in the matched sample that were current two months prior

Table 5: Summary Statistics for Subprime FRMs

	Countrywide			Rest			Total		
	mean	sd	count	mean	sd	count	mean	sd	count
0-1 Months of Utilization	0.56	0.50	10,516	0.59	0.49	46,373	0.58	0.49	56,889
2-4 Months of Util	0.16	0.37	10,516	0.13	0.34	46,373	0.14	0.35	56,889
5+ Months of Util	0.20	0.40	10,516	0.16	0.36	46,373	0.17	0.37	56,889
CLTV < 100	0.34	0.47	10,516	0.34	0.47	46,373	0.34	0.47	56,889
100 ≤ CLTV < 120	0.20	0.40	10,516	0.21	0.41	46,373	0.21	0.41	56,889
120 ≤ CLTV	0.15	0.36	10,516	0.11	0.31	46,373	0.12	0.32	56,889
<i>BlackBox Controls</i>									
- Initial CTIV	84.6	8.16	10,477	85.3	8.24	30,882	85.1	8.22	41,359
- Current LTV	101.0	21.8	7,385	99.2	19.6	30,888	99.5	20.1	38,273
- Initial Interest Rate	7.77	1.23	10,516	8.53	1.31	46,373	8.39	1.33	56,889
- Current Interest Rate	7.67	1.22	10,516	8.45	1.33	46,371	8.30	1.35	56,887
- Origination FICO	580.2	30.1	10,516	578.1	33.9	46,373	578.5	33.3	56,889
- Origination Balance	171,049	105,817	10,516	154,819	109,050	46,373	157,819	108,642	56,889
- Low/No Doc	0.15	0.36	10,516	0.33	0.47	46,373	0.30	0.46	56,889
- Doc Missing	0.00067	0.026	10,516	0.16	0.37	46,373	0.13	0.34	56,889
- Refi	0.12	0.32	10,516	0.20	0.40	46,373	0.18	0.39	56,889
- Cash Out Refi	0.74	0.44	10,516	0.45	0.50	46,373	0.51	0.50	56,889
- Purchase Missing	0.00076	0.028	10,516	0.18	0.38	46,373	0.15	0.35	56,889
- Interest Only	0.069	0.25	10,516	0.038	0.19	46,373	0.043	0.20	56,889
- Interest Only Missing	0.00076	0.028	10,516	0.13	0.34	46,373	0.11	0.31	56,889
- Mortgage Insured	0.0013	0.036	10,516	0.045	0.21	46,373	0.037	0.19	56,889
- Prepay Penalty	0.76	0.42	10,516	0.56	0.50	46,373	0.60	0.49	56,889
- Prior 60 DPD	0.12	0.33	10,516	0.13	0.34	46,373	0.13	0.34	56,889
- 60 DPD in Prior Year	0.078	0.27	10,516	0.100	0.30	46,373	0.096	0.29	56,889
<i>Equifax Controls</i>									
- Current CLTV	104.8	24.1	7,291	102.1	21.3	30,457	102.6	21.9	37,748
- CLTV Missing	0.31	0.46	10,516	0.34	0.47	46,373	0.34	0.47	56,889
- Initial Vantage	659.3	56.0	10,516	655.9	58.3	46,373	656.5	57.9	56,889
- Current Vantage	672.5	74.5	10,462	656.7	73.1	46,125	659.6	73.6	56,587
- 2 nd Lien Balance	41,590	29,719	2,445	39,106	34,755	7,414	39,722	33,592	9,859
- CES+	0.22	0.42	10,516	0.16	0.37	46,373	0.17	0.38	56,889
- Low Util HELOC	0.029	0.17	10,516	0.015	0.12	46,373	0.017	0.13	56,889
- Utilization	0.49	0.37	10,472	0.47	0.39	46,174	0.47	0.38	56,646
- Months of Credit	3.45	5.74	9,682	2.84	5.31	40,880	2.95	5.40	50,562

Sample statistics are measured as of September 2008 among loans in the matched sample that were current two months prior

Table 6: Summary Statistics for Non-Subprime FRMs

	Countrywide			Rest			Total		
	mean	sd	count	mean	sd	count	mean	sd	count
0-1 Months of Utilization	0.15	0.35	119,686	0.18	0.39	290,872	0.17	0.38	410,558
2-4 Months of Util	0.14	0.34	119,686	0.15	0.36	290,872	0.15	0.36	410,558
5+ Months of Util	0.68	0.47	119,686	0.60	0.49	290,872	0.63	0.48	410,558
CLTV < 100	0.33	0.47	119,686	0.35	0.48	290,872	0.34	0.47	410,558
100 ≤ CLTV < 120	0.26	0.44	119,686	0.26	0.44	290,872	0.26	0.44	410,558
120 ≤ CLTV	0.22	0.42	119,686	0.19	0.39	290,872	0.20	0.40	410,558
<i>BlackBox Controls</i>									
- Initial CTLV	87.3	9.67	119,447	88.5	9.28	174,517	88.0	9.46	293,964
- Current LTV	102.0	21.2	99,270	100.8	20.6	237,997	101.1	20.8	337,267
- Initial Interest Rate	6.40	0.52	119,686	6.72	0.92	290,872	6.63	0.83	410,558
- Current Interest Rate	6.40	0.51	119,686	6.73	0.89	290,869	6.63	0.81	410,555
- Origination FICO	719.2	48.5	119,686	710.8	51.9	290,872	713.2	51.1	410,558
- Origination Balance	317,841	202,217	119,686	340,748	222,603	290,872	334,070	217,108	410,558
- Low/No Doc	0.67	0.47	119,686	0.66	0.47	290,872	0.66	0.47	410,558
- Doc Missing	0.00058	0.024	119,686	0.22	0.42	290,872	0.16	0.36	410,558
- Refi	0.16	0.37	119,686	0.22	0.42	290,872	0.21	0.40	410,558
- Cash Out Refi	0.30	0.46	119,686	0.22	0.41	290,872	0.24	0.43	410,558
- Purchase Missing	0.00033	0.018	119,686	0.073	0.26	290,872	0.052	0.22	410,558
- Interest Only	0.36	0.48	119,686	0.15	0.36	290,872	0.21	0.41	410,558
- Interest Only Missing	0.00070	0.026	119,686	0.040	0.20	290,872	0.028	0.17	410,558
- Mortgage Insured	0.015	0.12	119,686	0.066	0.25	290,872	0.051	0.22	410,558
- Prepay Penalty	0.11	0.31	119,686	0.21	0.41	290,872	0.18	0.39	410,558
- Prior 60 DPD	0.015	0.12	119,686	0.017	0.13	290,872	0.017	0.13	410,558
- 60 DPD in Prior Year	0.0096	0.098	119,686	0.012	0.11	290,872	0.011	0.11	410,558
<i>Equifax Controls</i>									
- Current CLTV	108.8	24.5	97,257	106.9	23.9	232,987	107.5	24.1	330,244
- CLTV Missing	0.19	0.39	119,686	0.20	0.40	290,872	0.20	0.40	410,558
- Initial Vantage	788.3	83.3	119,686	799.3	102.0	290,870	796.1	97.1	410,556
- Current Vantage	809.5	109.6	119,328	802.6	122.5	290,017	804.6	118.9	409,345
- 2 nd Lien Balance	68,308	58,194	70,844	77,253	65,699	147,495	74,351	63,500	218,339
- CES+	0.46	0.50	119,686	0.40	0.49	290,872	0.42	0.49	410,558
- Low Util HELOC	0.16	0.37	119,686	0.15	0.35	290,872	0.15	0.36	410,558
- Utilization	0.31	0.30	117,944	0.33	0.31	286,797	0.32	0.31	404,741
- Months of Credit	13.2	10.7	115,291	11.2	10.1	273,878	11.8	10.3	389,169

Sample statistics are measured as of September 2008 among loans in the matched sample that were current two months prior

Table 7: 2/28 ARM Probit Panel 2008-Feb-2009-Rolling 60 DPD

	(1)	(2)	(3)	(4)	(5)
	Base Sample	Base Sample	Matched Sample	Matched Sample	Matched: Current Revolving
Countrywide x Jan-Mar (d)	-0.0062** (-9.96)	-0.00069 (-1.12)	-0.00081 (-1.22)	-0.00054 (-0.86)	-0.00017 (-0.54)
Countrywide x Apr-Jun (d)	-0.0062** (-9.59)	-0.0024** (-3.95)	-0.0025** (-3.85)	-0.0025** (-4.06)	-0.0013** (-4.49)
Countrywide x Oct-Dec (d)	0.011** (12.69)	0.0073** (9.73)	0.0064** (7.99)	0.0063** (8.32)	0.0023** (5.78)
Countrywide x Jan-Feb (d)	0.0036** (3.88)	0.0014 (1.79)	0.00032 (0.37)	0.00069 (0.86)	0.00011 (0.28)
Countrywide (d)	0.0062** (11.00)	0.0017** (3.19)	0.0021** (3.76)	0.0032** (5.84)	0.0012** (4.23)
Jan-Mar (d)	-0.0049** (-18.68)	-0.0027** (-10.96)	-0.0029** (-9.99)	-0.0033** (-12.21)	-0.0015** (-10.79)
Apr-Jun (d)	-0.0037** (-13.76)	-0.0030** (-12.51)	-0.0030** (-10.69)	-0.0033** (-12.62)	-0.00077** (-5.44)
Oct-Dec (d)	0.0088** (27.55)	0.0076** (26.29)	0.0075** (22.17)	0.0073** (22.60)	0.0033** (18.32)
Jan-Feb (d)	0.018** (44.08)	0.015** (40.47)	0.016** (34.20)	0.015** (34.98)	0.0066** (26.27)
Origination Quarter	No	Yes	Yes	Yes	Yes
BlackBox Control	No	Yes	Yes	Yes	Yes
MSA Control	No	Yes	Yes	Yes	Yes
Reset Control	No	Yes	Yes	Yes	Yes
Equifax Control	No	No	No	Yes	Yes
N. of cases	5787121	5787121	3991093	3991093	3989666
Avg. Delinquency	0.049	0.049	0.048	0.048	0.017
Avg. Share Countrywide	0.14	0.14	0.17	0.17	0.17

Marginal effects; t statistics in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.05$, ** $p < 0.01$

Table 8: 2/28 ARMs Probit Panel 2008-Feb 2009–Straight 60 DPD by Utilization and CLTV

	(1)	(2)	(3)	(4)	(5)	(6)
	5+ Months of Util	2-4 Months	0-1 Months	CLTV < 100	100 ≤ CLTV < 120	120 ≤ CLTV
Countrywide x Jan-Mar (d)	0.00067 (0.69)	-0.0013 (-1.01)	-0.00093 (-1.07)	0.00062 (0.57)	0.00025 (0.21)	-0.0050** (-2.69)
Countrywide x Apr-Jun (d)	-0.00020 (-0.21)	-0.0031* (-2.43)	-0.0033** (-3.85)	-0.0019 (-1.75)	-0.0023* (-2.03)	-0.0050** (-2.87)
Countrywide x Oct-Dec (d)	0.0063** (4.88)	0.0049** (2.93)	0.0067** (6.47)	0.0045** (3.05)	0.0067** (4.48)	0.0087** (4.54)
Countrywide x Jan-Feb (d)	-0.00018 (-0.16)	-0.0017 (-1.04)	0.0021 (1.85)	0.0043* (2.40)	0.0014 (0.86)	-0.0020 (-0.98)
Countrywide (d)	0.00017 (0.22)	0.0028* (2.33)	0.0045** (5.88)	0.0016 (1.63)	0.0033** (3.27)	0.0071** (4.81)
Jan-Mar (d)	-0.0039** (-9.69)	-0.0030** (-5.00)	-0.0032** (-8.68)	-0.0020** (-4.72)	-0.0022** (-4.30)	-0.00064 (-0.68)
Apr-Jun (d)	-0.0013** (-3.11)	-0.0013* (-2.16)	-0.0048** (-13.14)	-0.0037** (-8.62)	-0.0034** (-6.84)	-0.00024 (-0.30)
Oct-Dec (d)	0.0042** (8.16)	0.0068** (9.00)	0.0084** (19.26)	0.0057** (9.63)	0.0075** (11.74)	0.011** (12.98)
Jan-Feb (d)	0.011** (14.66)	0.017** (15.55)	0.016** (28.16)	0.011** (13.51)	0.015** (16.94)	0.025** (22.86)
Origination Quarter	Yes	Yes	Yes	Yes	Yes	Yes
BlackBox Control	Yes	Yes	Yes	Yes	Yes	Yes
MSA Control	Yes	Yes	Yes	Yes	Yes	Yes
Reset Control	Yes	Yes	Yes	Yes	Yes	Yes
Equifax Control	Yes	Yes	Yes	Yes	Yes	Yes
N. of cases	776420	617815	2590471	972737	1078316	960856
Avg. Delinquency	0.030	0.039	0.055	0.031	0.039	0.078
Avg. Share Countrywide	0.17	0.18	0.16	0.15	0.17	0.18

Marginal effects; *t* statistics in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.05$, ** $p < 0.01$

Table 9: 3/27 ARM Probit Panel 2008-Feb 2009-Rolling 60 DPD

	(1)	(2)	(3)	(4)	(5)
	Base Sample	Base Sample	Matched Sample	Matched Sample	Matched: Current Revolving
Countrywide x Jan-Mar (d)	-0.0045** (-5.98)	0.00086 (1.07)	0.00098 (1.13)	0.00065 (0.85)	-0.00038 (-0.99)
Countrywide x Apr-Jun (d)	-0.0036** (-4.61)	-0.00096 (-1.31)	-0.0011 (-1.42)	-0.0012 (-1.81)	-0.00045 (-1.25)
Countrywide x Oct-Dec (d)	0.0075** (7.59)	0.0052** (6.12)	0.0047** (5.18)	0.0045** (5.46)	0.0017** (3.86)
Countrywide x Jan-Feb (d)	-0.0011 (-1.17)	-0.0014 (-1.72)	-0.0011 (-1.27)	-0.00044 (-0.55)	-0.00049 (-1.36)
Countrywide (d)	0.0100** (13.87)	0.0015* (2.41)	0.0016* (2.44)	0.0014* (2.44)	0.0011** (3.37)
Jan-Mar (d)	-0.0082** (-22.77)	-0.0030** (-8.57)	-0.0033** (-8.08)	-0.0032** (-9.14)	-0.0011** (-5.45)
Apr-Jun (d)	-0.0059** (-15.94)	-0.0031** (-9.34)	-0.0033** (-8.42)	-0.0032** (-9.39)	-0.0011** (-5.93)
Oct-Dec (d)	0.0085** (18.31)	0.0061** (15.46)	0.0061** (13.08)	0.0056** (13.46)	0.0021** (9.18)
Jan-Feb (d)	0.017** (27.59)	0.012** (22.98)	0.012** (19.12)	0.011** (19.32)	0.0052** (15.14)
Origination Quarter	No	Yes	Yes	Yes	Yes
BlackBox Control	No	Yes	Yes	Yes	Yes
MSA Control	No	Yes	Yes	Yes	Yes
Reset Control	No	Yes	Yes	Yes	Yes
Equifax Control	No	No	No	Yes	Yes
N. of cases	1895030	1894912	1366511	1366496	1355496
Avg. Delinquency	0.037	0.037	0.036	0.036	0.012
Avg. Share Countrywide	0.19	0.19	0.22	0.22	0.22

Marginal effects; t statistics in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.05$, ** $p < 0.01$

Table 10: 3/27 ARMs Probit Panel 2008-Feb 2009–Straight 60 DPD by Utilization and CLTV

	(1)	(2)	(3)	(4)	(5)	(6)
	5+ Months of Util					
	2-4 Months	0-1 Months	CLTV < 100	100 ≤ CLTV < 120	120 ≤ CLTV	
Countrywide x Jan-Mar (d)	-0.0013 (-1.61)	0.0030 (1.43)	0.0010 (0.76)	-0.00054 (-0.57)	0.0017 (1.17)	0.00080 (0.28)
Countrywide x Apr-Jun (d)	-0.0011 (-1.55)	0.00034 (0.19)	-0.0018 (-1.48)	-0.0022** (-2.69)	0.0022 (1.52)	-0.0046* (-2.15)
Countrywide x Oct-Dec (d)	0.0015 (1.65)	0.0035 (1.76)	0.0073** (5.02)	0.0026* (2.15)	0.0091** (4.92)	0.0016 (0.74)
Countrywide x Jan-Feb (d)	-0.00098 (-1.21)	0.00026 (0.13)	-0.000100 (-0.07)	0.00043 (0.33)	0.0013 (0.76)	-0.0037 (-1.70)
Countrywide (d)	0.0021** (2.86)	-0.000017 (-0.01)	0.0015 (1.45)	0.0015 (1.70)	0.00011 (0.10)	0.0051** (2.81)
Jan-Mar (d)	-0.0023** (-6.00)	-0.0051** (-6.47)	-0.0034** (-5.17)	-0.0016** (-3.51)	-0.0029** (-4.52)	-0.0063** (-4.65)
Apr-Jun (d)	-0.0011** (-2.99)	-0.0047** (-6.28)	-0.0045** (-7.18)	-0.0018** (-4.03)	-0.0037** (-6.12)	-0.0040** (-3.46)
Oct-Dec (d)	0.0033** (6.94)	0.0045** (4.71)	0.0081** (10.77)	0.0041** (6.33)	0.0052** (6.72)	0.0093** (7.91)
Jan-Feb (d)	0.0077** (10.64)	0.0081** (6.35)	0.015** (15.39)	0.0063** (7.07)	0.010** (9.36)	0.021** (13.65)
Origination Quarter	Yes	Yes	Yes	Yes	Yes	Yes
BlackBox Control	Yes	Yes	Yes	Yes	Yes	Yes
MSA Control	Yes	Yes	Yes	Yes	Yes	Yes
Reset Control	Yes	Yes	Yes	Yes	Yes	Yes
Equifax Control	Yes	Yes	Yes	Yes	Yes	Yes
N. of cases	444961	215895	689025	390508	390655	297171
Avg. Delinquency	0.021	0.029	0.047	0.029	0.030	0.058
Avg. Share Countrywide	0.19	0.22	0.24	0.20	0.21	0.22

Marginal effects; t statistics in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.05$, ** $p < 0.01$

Table 11: Subprime FRMs Probit Panel 2008-Feb 2009-Straight 60

	(1)	(2)	(3)	(4)	(5)
	Base Sample	Base Sample	Matched Sample	Matched Sample	Matched: Current Revolving
Countrywide x Jan-Mar (d)	0.0042** (2.71)	0.0045** (3.46)	0.0048** (3.57)	0.0043** (3.55)	0.00090 (1.42)
Countrywide x Apr-Jun (d)	-0.000050 (-0.04)	0.00064 (0.57)	0.00042 (0.36)	0.00041 (0.40)	0.00054 (0.93)
Countrywide x Oct-Dec (d)	0.0084** (4.91)	0.0052** (3.93)	0.0055** (4.03)	0.0048** (3.90)	0.0027** (3.39)
Countrywide x Jan-Feb (d)	0.0077** (3.97)	0.0070** (4.33)	0.0076** (4.49)	0.0069** (4.45)	0.0017* (2.17)
Countrywide (d)	-0.011** (-15.33)	-0.0051** (-7.80)	-0.0047** (-6.90)	-0.0032** (-5.03)	-0.0014** (-5.06)
Jan-Mar (d)	-0.0048** (-11.59)	-0.0026** (-7.59)	-0.0028** (-7.06)	-0.0029** (-8.44)	-0.00075** (-4.51)
Apr-Jun (d)	-0.0034** (-8.00)	-0.0024** (-7.10)	-0.0023** (-6.10)	-0.0025** (-7.30)	-0.00056** (-3.45)
Oct-Dec (d)	0.0011* (2.24)	0.0011** (2.96)	0.00070 (1.64)	0.0011** (2.79)	0.00036 (1.90)
Jan-Feb (d)	0.0011* (2.00)	0.000088 (0.21)	-0.00015 (-0.31)	0.00058 (1.26)	0.00060** (2.61)
Origination Quarter	No	Yes	Yes	Yes	Yes
BlackBox Control	No	Yes	Yes	Yes	Yes
MSA Control	No	Yes	Yes	Yes	Yes
Equifax Control	No	No	No	Yes	Yes
N. of cases	1124596	1123728	822196	822196	811855
Avg. Delinquency	0.016	0.016	0.015	0.015	0.0030
Avg. Share Countrywide	0.15	0.15	0.18	0.18	0.18

Marginal effects; t statistics in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.05$, ** $p < 0.01$

Table 12: Non-Subprime FRMs Probit Panel 2008-Feb 2009-Straight 60 DPD

	(1)	(2)	(3)	(4)	(5)
	Base Sample	Base Sample	Matched Sample	Matched Sample	Matched: Current Revolving
Countrywide x Jan-Mar (d)	0.00055* (2.35)	0.00045** (2.82)	0.00014 (0.90)	0.000047 (0.48)	0.000012 (0.18)
Countrywide x Apr-Jun (d)	0.00083** (3.48)	0.00061** (3.75)	0.00044** (2.76)	0.00026* (2.46)	0.000065 (0.94)
Countrywide x Oct-Dec (d)	-0.00041* (-2.12)	-0.00045** (-3.65)	-0.00042** (-3.49)	-0.00025** (-3.17)	-0.00012* (-2.47)
Countrywide x Jan-Feb (d)	-0.000099 (-0.47)	-0.00026 (-1.92)	-0.00032* (-2.41)	-0.00014 (-1.63)	-0.000053 (-0.95)
Countrywide (d)	-0.00014 (-0.91)	0.00088** (7.65)	0.00086** (7.41)	0.00082** (10.28)	0.00042** (7.76)
Jan-Mar (d)	-0.0021** (-21.74)	-0.00064** (-8.74)	-0.00050** (-6.31)	-0.00043** (-8.73)	-0.00023** (-6.70)
Apr-Jun (d)	-0.0017** (-17.36)	-0.00076** (-10.67)	-0.00063** (-8.30)	-0.00049** (-10.26)	-0.00016** (-4.67)
Oct-Dec (d)	0.0035** (27.37)	0.0023** (25.96)	0.0021** (21.75)	0.0014** (21.43)	0.00070** (14.61)
Jan-Feb (d)	0.0068** (39.16)	0.0045** (35.84)	0.0042** (29.91)	0.0028** (28.71)	0.0014** (19.52)
Origination Quarter	No	Yes	Yes	Yes	Yes
BlackBox Control	No	Yes	Yes	Yes	Yes
MSA Control	No	Yes	Yes	Yes	Yes
Equifax Control	No	No	No	Yes	Yes
N. of cases	7818699	7799141	5857716	5857683	5816389
Avg. Delinquency	0.0068	0.0068	0.0061	0.0061	0.0020
Avg. Share Countrywide	0.26	0.26	0.29	0.29	0.29

Marginal effects; t statistics in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.05$, ** $p < 0.01$

Appendix

Table 13: 2/28 ARM Probit Panel 2008-Feb 2009-Rolling 60 DPD

	(1) Base Sample	(2) Base Sample	(3) Matched Sample	(4) Matched Sample	(5) Current Revolving
Countrywide x Jan-Mar (d)	-0.0062** (-9.96)	-0.00069 (-1.12)	-0.00081 (-1.22)	-0.00054 (-0.86)	-0.00017 (-0.54)
Countrywide x Apr-Jun (d)	-0.0062** (-9.59)	-0.0024** (-3.95)	-0.0025** (-3.85)	-0.0025** (-4.06)	-0.0013** (-4.49)
Countrywide x Oct-Dec (d)	0.011** (12.69)	0.0073** (9.73)	0.0064** (7.99)	0.0063** (8.32)	0.0023** (5.78)
Countrywide x Jan-Feb (d)	0.0036** (3.88)	0.0014 (1.79)	0.0032 (0.37)	0.00069 (0.86)	0.00011 (0.28)
Countrywide (d)	0.0062** (11.00)	0.0017** (3.19)	0.0021** (3.76)	0.0032** (5.84)	0.0012** (4.23)
Jan-Mar (d)	-0.0049** (-18.68)	-0.0027** (-10.96)	-0.0029** (-9.99)	-0.0033** (-12.21)	-0.0015** (-10.79)
Apr-Jun (d)	-0.0037** (-13.76)	-0.0030** (-12.51)	-0.0030** (-10.69)	-0.0033** (-12.62)	-0.00077** (-5.44)
Oct-Dec (d)	0.0088** (27.55)	0.0076** (26.29)	0.0075** (22.17)	0.0073** (22.60)	0.0033** (18.32)
Jan-Feb (d)	0.018** (44.08)	0.015** (40.47)	0.016** (34.20)	0.015** (34.98)	0.0066** (26.27)
Initial CLTV (x 100)		-0.053 (-1.57)	-0.073 (-1.85)		
Initial CLTV ²		0.044* (2.33)	0.055* (2.49)		
Initial CLTV Missing (d)		-0.014 (-0.97)	-0.023 (-1.32)		
Current LTV (x 100)		0.075** (26.78)	0.072** (21.70)		
Current LTV ²		-0.022** (-20.19)	-0.021** (-15.97)		

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	(1) Base Sample	(2) Base Sample	(3) Matched Sample	(4) Matched Sample	(5) Current Revolving
Current LTV Missing (d)		0.052** (18.12)	0.051** (14.88)		
Initial Interest Rate		0.0033** (39.13)	0.0032** (33.05)	0.0034** (36.19)	0.0014** (28.26)
Δ in Int Rates		0.0085** (110.64)	0.0080** (89.91)	0.0081** (97.04)	0.0027** (62.83)
Interest Rate Missing (d)		0.0093** (3.32)	0.0100** (3.01)	0.011** (3.32)	0.0044* (2.39)
FICO Score		-0.014** (-70.82)	-0.013** (-57.34)	-0.0071** (-31.24)	-0.0018** (-15.61)
FICO Missing (d)		-0.069** (-74.20)	-0.068** (-59.34)	-0.041** (-36.38)	-0.011** (-18.76)
Low/No Doc (d)		0.011** (57.59)	0.0098** (46.32)	0.0090** (45.01)	0.0026** (24.89)
Origination Balance (x 100k)		0.0021** (24.91)	0.0018** (17.94)	0.0032** (31.84)	-0.000019 (-0.38)
Refi (d)		-0.0094** (-36.70)	-0.0077** (-25.64)	-0.0052** (-17.57)	-0.0023** (-15.44)
Cash Out Refi (d)		-0.0085** (-47.91)	-0.0074** (-35.70)	-0.0032** (-15.09)	-0.0024** (-22.70)
Purchase Missing (d)		-0.0019** (-4.41)	-0.0017** (-3.32)	-0.0010* (-2.13)	-0.00094** (-4.07)
Interest Only (d)		0.0070** (27.70)	0.0064** (21.59)	0.0056** (19.65)	0.0016** (11.95)
Interest Only Missing (d)		-0.000014 (-0.02)	0.00057 (0.77)	-0.00098 (-1.45)	-0.00040 (-1.17)
Mortgage Insured (d)		-0.0028** (-5.89)	-0.0032** (-5.78)	-0.00073 (-1.34)	-0.00076** (-2.85)
Prepay Penalty (d)		-0.00069** (-3.38)	-0.00015 (-0.62)	-0.00041 (-1.86)	0.00011 (0.99)

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	(1) Base Sample	(2) Base Sample	(3) Matched Sample	(4) Matched Sample	(5) Matched: Current Revolving
3 Months After Reset (d)	0.0031** (10.12)	0.0025** (6.84)	0.0027** (7.99)	0.0012** (6.59)	
Countrywide x 3 Months Reset (d)	-0.0034** (-4.91)	-0.0032** (-4.36)	-0.0031** (-4.40)	-0.00085* (-2.57)	
6 Months After Reset (d)	0.0068** (23.77)	0.0070** (20.54)	0.0064** (19.86)	0.0024** (14.15)	
Countrywide x 6 Months Reset (d)	0.0060** (7.70)	0.0062** (7.38)	0.0059** (7.45)	0.0022** (5.56)	
Prior 60 DPD (d)	0.035** (49.79)	0.037** (44.19)	0.021** (30.95)	0.0086** (21.00)	
60 DPD in Prior Year (d)	0.028** (39.69)	0.026** (32.47)	0.018** (25.54)	0.0037** (10.68)	
Initial CLTV (x 100)			0.011 (1.61)	0.0015 (0.48)	
Initial CLTV ²			-0.0027 (-0.77)	-0.00021 (-0.13)	
Initial CLTV Missing (d)			0.0089* (2.33)	0.0016 (0.97)	
Current CLTV			0.055** (22.74)	0.023** (19.31)	
Current CLTV ²			-0.012** (-13.79)	-0.0053** (-12.62)	
Current CLTV Missing (d)			0.053** (18.82)	0.028** (13.13)	
Initial Vantage (x 100)			-0.016** (-87.88)	0.0027** (31.85)	
Δ Vantage (x 100)			-0.025** (-90.38)	-0.00081** (-5.64)	
Δ Vantage ²			0.0025** (14.42)	0.0015** (16.29)	

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	(1)	(2)	(3)	(4)	(5)
	Base Sample	Base Sample	Matched Sample	Matched Sample	Matched: Current Revolving
2 nd Lien Balance (x 100k)				0.0097** (26.01)	0.0024** (13.66)
CES+ (d)				-0.000091 (-0.31)	0.00035* (2.35)
Low Util HELOC (d)				-0.0084** (-14.45)	-0.0030** (-12.00)
Utilization				-0.0096** (-38.05)	-0.0064** (-45.52)
Months of Credit				-0.00060** (-22.79)	-0.00043** (-34.24)
Vantage Missing (d)				0.021** (8.22)	-0.0073** (-17.49)
Utilization Missing (d)				-0.0029* (-2.43)	-0.0015** (-2.58)
Months of Credit Missing (d)				-0.0032** (-10.82)	-0.0046** (-38.66)
Origination Quarter	No	Yes	Yes	Yes	Yes
MSA Control	No	Yes	Yes	Yes	Yes
N. of cases	5787121	5787121	3991093	3991093	3989666
Avg. Delinquency	0.049	0.049	0.048	0.048	0.017
Avg. Share Countrywide	0.14	0.14	0.17	0.17	0.17

Marginal effects; t statistics in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.05$, ** $p < 0.01$

Table 14: 2/28 ARMs Probit Panel 2008-Feb 2009–Straight 60 DPD by Origination Quarter

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	2005Q1	2005Q2	2005Q3	2005Q4	2006Q1	2006Q2	2006Q3	2006Q4	2007Q1	2007Q2
Countrywide x Jan-Mar (d)	0.0075 (1.36)	-0.0010 (-0.30)	-0.0018 (-0.42)	-0.0059 (-1.23)	-0.0070** (-2.98)	-0.0015 (-0.63)	0.0024 (1.35)	0.0016 (1.10)	-0.00016 (-0.10)	-0.0050 (-1.41)
Countrywide x Apr-Jun (d)	0.0048 (0.84)	-0.00075 (-0.21)	0.0012 (0.40)	-0.0069* (-2.00)	-0.0066** (-2.79)	-0.0052** (-2.92)	-0.0023 (-1.44)	0.00035 (0.24)	-0.00043 (-0.27)	-0.0055 (-1.59)
Countrywide x Oct-Dec (d)	0.016* (2.30)	0.011* (2.34)	0.0051 (1.54)	0.0019 (0.65)	0.013** (3.42)	0.016** (5.28)	0.0053* (2.25)	0.0027 (1.57)	0.00049 (0.30)	-0.0030 (-0.78)
Countrywide x Jan-Feb (d)	0.0047 (0.69)	-0.00042 (-0.09)	-0.00013 (-0.04)	-0.0085** (-3.11)	-0.0043 (-1.35)	-0.0014 (-0.54)	0.0050 (1.43)	0.0019 (0.70)	0.00089 (0.44)	0.00095 (0.19)
Countrywide (d)	-0.0045 (-1.35)	0.0060 (1.93)	0.0044 (1.87)	0.012** (4.75)	0.0071* (2.25)	0.0026 (1.10)	0.000028 (0.02)	0.0011 (1.07)	0.0027* (2.13)	0.010* (2.45)
Jan-Mar (d)	0.0035* (2.41)	0.0027* (2.28)	-0.0034* (-2.14)	-0.0064** (-3.36)	-0.010** (-10.11)	-0.0054** (-5.23)	-0.0036** (-4.72)	-0.0044** (-6.59)	-0.0031** (-4.30)	-0.0031 (-1.94)
Apr-Jun (d)	-0.0016 (-1.23)	0.00041 (0.36)	-0.0013 (-1.33)	0.0036* (2.28)	-0.0029** (-2.66)	-0.0059** (-7.24)	-0.0045** (-6.05)	-0.0052** (-8.16)	-0.0039** (-5.52)	-0.0023 (-1.50)
Oct-Dec (d)	0.0063** (4.09)	0.0036** (2.94)	0.0054** (4.72)	0.0060** (5.25)	-0.0014 (-1.27)	0.0089** (7.41)	0.011** (9.31)	0.0079** (8.74)	0.0087** (9.60)	0.0096** (4.77)
Jan-Feb (d)	0.013** (6.58)	0.013** (7.97)	0.011** (7.57)	0.016** (10.54)	0.0037* (2.47)	0.014** (9.09)	0.023** (10.45)	0.019** (10.20)	0.019** (13.82)	0.020** (6.77)
BlackBox Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reset Control	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Equifax Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N. of cases	143970	255788	361893	409737	446828	614231	612005	602500	428763	78928
Avg. Delinquency	0.038	0.052	0.055	0.059	0.068	0.063	0.041	0.038	0.033	0.037
Avg. Share Countrywide	0.067	0.074	0.10	0.11	0.13	0.20	0.21	0.23	0.21	0.11

Marginal effects; t statistics in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.05$, ** $p < 0.01$